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EDITORIAL NOTES.

Fuel Economy Campaign—Developing Plans.

FRESH ground was opened by Professor W. A. Bone, F.R.S., in the fuel economy campaign on Monday last week, when he addressed the members of the London Section of the Society of Chemical Industry, and sought to enlist their active sympathy and support in the matter, because, as he says, unless the British Association Committee who are dealing with this question have behind them the necessary driving power to enlighten a non-technical public, their labours will be largely in vain. This is true; but chemists generally ought not to need any urging in this matter, for it is pre-eminently one that the interests of their profession require should be earnestly taken up. Fuel economy stands for larger chemical control in industries and chemical opportunities through a reduced destruction and greater recovery of the valuable constituents of coal. The British Association Committee desire not only that the influence of chemists shall be brought to bear in every possible useful direction, but that their experience and knowledge in connection with different branches of industry, so far as the experience and knowledge have application to the subject in hand, shall be drawn upon in the way of helpful suggestion and criticism.

The inquiry that the Committee have undertaken is a large one; and, unless it is approached and dealt with in a systematic manner, absolute failure so far as any good goes is a certain result. From the vastness of method that suggests itself, Professor Bone and his Committee have properly decided to prosecute the work on a sectional plan—that is to say, divide or group up the uses of coal, and for each division an Investigating Committee has been appointed, with a competent Chairman. The initial work which these Committees are to pursue is to endeavour to arrive at, by the aid of collected definite data, a judgment as to the approximate average fuel efficiencies actually realized in industrial and other operations, the highest average efficiencies which may be expected by the utilization of the best available appliances and methods, and the probable margin of economy. The lines of the plans of initial procedure are supported by Mr. Charles Carpenter, D.Sc, the President of the Society of Chemical Industry. There is no question as to their wisdom; and for very good reasons. It will largely depend on the case that these Committees are able to prepare and submit, whether there will result any effective action in promoting the end sought. It is no use, in the first instance, trying to stir up the public to back a movement for securing Government aid in fuel economy. The public, experience proves, will not be deeply stirred by any movement which has not upon it the seal of governmental authority, and sometimes not even then. If only they could be so stirred, if they could be made to realize before the Government what this fuel economy question really means nationally, and to act upon the realization, then the work of the British Association Committee would be a long way on the road to completion. Failing the appreciation of the public that this is largely their question, and thus the impossibility of doing effective work without Government recognition and aid, then the Committee have first to pave the way to convincing the Government that here is a matter of far-reaching importance in which, in the national interests, it is their duty to pass from a passive to an active attitude. But how the Government can best help is a matter that is in a state of embryo in the minds of the British Association Committee. The whole movement is new and must undergo evolution, by the application of intellect and work, just as in other mundane developments.

However, having secured and compiled the data as to realized and possible average fuel efficiencies, Professor Bone tentatively suggests that the Government might help either by the establishment of Fuel Advisory and Central Boards, or by providing all that is requisite for large-scale experiments in a central fuel experimental station; or both. All the proof that the Committee can obtain that there is national economy, and therefore money, in what is proposed will be required to stimulate the Government to move in the matter. There is, too, the question of finance. Providing that the handling of the scheme by the Government was on practical lines, any requisite money invested in it from the nation's ordinary resources would be nationally profitable manyfold. In a matter of this kind, this would be the proper way to finance the scheme. But Professor Bone points out there is a simple way by which an abundance of money could be obtained for the work. Professor Armstrong recently at Newcastle suggested a small tax for the purpose on all coal raised; but Professor Bone prefers the revival of a tax on export coal of 1s. per ton, which, he says, would provide 5 million pounds sterling a year. The figure is somewhat beyond the actual. The exported coal in the bumper year of 1913 was 73,400,000 tons; and 1s. per ton on this would realize £3,670,000. The coal owners and the shippers would, of course, again rise up in arms against the proposal. But when the coal export tax was previously imposed, when British coal was high in price before and after the great coal strike of 1912, and during the present war, we have had lessons which show that price does not affect the demands of other countries for our coal. Another 1s. per ton on pithead prices in peace times would therefore do no manner of harm to British interests either in coal or shipping; and, if the proceeds were properly expended for such practical ends as the one suggested, our national interests would undoubtedly be promoted.

So far as to the lines of the plans that are receiving initial materialization, and that are in the minds of the British Association Committee regarding prospective development. Incidentally, there is a matter that comes close home to the gas industry. One of the divisional Committees is charged with the duty of collecting and collating information from the industries engaged in the carbonization of coal; and it is rightly said by Professor Bone that our knowledge concerning combustion and distillation is empirical. We believe he used the word "entirely," but "largely" would be hardly so sweeping, and certainly less condemnatory. But practice must continue in the main empirical, until thorough chemical investigation gives a clearer insight into the real nature of the complexity of the constitution of coals, and the methods of their decomposition by heat. Mr. Carpenter endorsed the deficiency of knowledge, and the existence of the empirical in carbonization so far as the gas industry is concerned. The distillation of coal in closed vessels has much about it that is still hidden from even the most erudite among coal carbonizers; and there are confessedly many unsolved problems that offer a vast field for scientific exploration work. Enlightenment would probably do much to help to place coal carbonization on a higher plane of profitableness. But, all the same, empirical though the gas industry largely is in the matter of carbonization, in making the indictment credit might have been given for the extraordinary advances that have been made by it in the economy of the coal it requires for producing its coal gas—not only through the increased production per ton of coal used, but through the utilization, when oil prices are favourable, of a large portion of its coke production. Without, however, taking carburetted water gas into calculation, nearly 2000 cubic feet more gas are now being made per ton of coal on an average throughout the country than was the case about a decade ago; and this means on the 16½ million tons now carbonized, a production of 33,000 million cubic feet of gas more than if the gas industry was still working to the make of a decade or so ago. Without reckoning the saving effected by carburetted water gas, the gas industry is economizing to the tune of about 2¾ million tons of coal, compared with ten years since. Truly, not a bad record in economy, despite our carbonization practices being largely empirical!

Gas Workers and Exemption.

At the beginning of this great and fearful war, and for several months after, the Allied countries paid an enormous and terrible penalty in life, territory, property, time, reputation, and in other ways, for a deficiency of high explosive shells, and of guns with which to deal with them. The deficiency has been largely redressed; but the level at which the production of high explosives has in this country to be maintained, and exceeded, in view of the huge requirements of the Allied forces, means that nothing must be allowed to intervene to prevent the sources of their supply being developed to the utmost extent. But if the responsible heads of the Government departments that are working in different directions in connection with the war have not the scales removed from their eyes, and their work is not better co-ordinated, there is a very good chance that there may be a gradual reversion to a shortage of high explosives. To those engaged in the work of the gas industry, the discordant acts of various departments are one of the amazing features of the war. For instance, those responsible for the securing of men for the country's Forces, are not the responsible chiefs of the department deputed to look after the supply of high explosives; and apparently they are so ignorant of the actual situation that men continue to be removed from the work of the gas industry into the military ranks, thus progressively tending to jeopardize the maintenance, and to effectually hinder the enlargement, of the source of the supply of the requisites for the manufacture of high explosives. Those charged with the duty of allowing or disallowing exemptions sadly need a few plain facts forced upon their attention; but the difficulty is to get them to pay heed to anything that is plain, other than their own particular objective.

The narrow and undiscerning attitude in this respect was well illustrated the other day at a meeting in the City, when it was stated, by a speaker representing the Government, that it must be recognized that the requirement of men for the country's Forces must take precedence over the requirement of men for industry. This is freely acknowledged up to a point; and, at this point, it is submitted that, so far as the gas industry is concerned, the statement requires very important qualification. In the gas industry men are as essential as coal; for a deficiency of the one or the other means that the volume of the gas supply must be seriously interfered with. And if the volume of gas supply is reduced, it means that the source of important essentials to the production of high explosives is also lessened. We are not prepared to lay much stress on the point as to the further depletion of the man power of the gas industry affecting (important though this is) the gas service from the point of view of the community, seeing that all the public services have been seriously interfered with through the same cause, and we have all to share in the inconveniences and losses so occasioned. But if the Government require the gas industry to maintain its services in connection with the war (the Ministry of Munitions are ever crying out for more and more toluol, and munitions factories demand full supplies of gas), then the Government must spare the industry further inroads upon its men—its men engaged upon the work of the district, as well as those employed in the manufacturing processes. And for the simple reason that it is no use making any more gas than can be sold. The producing capacity of many gas-works is to-day very far in excess of the need through the necessary street and shop lighting restrictions, and the shorter hours of the opening of licensed premises. These restrictions mean the curtailment of the output of gas, and consequently of the source of toluol. So, if the Government require the gas industry to go on increasing the supply of toluol, then the work of producing gas-consumption compensation through new connections in the districts of supply must not be impeded. This is obvious to gas men, for whom we are not writing. Apparently, however, there is inappreciation of the fact in those quarters (and it is to those quarters to which our remarks are addressed) in which repose supreme rule in the matter of exemption from enlistment. To them we emphasize the point that the district work of gas undertakings must not be interrupted, if the best possible is to be done within the gas-works. We know that it is argued that the district men who are engaged on new installations cannot be regarded as necessary for the maintenance of existing gas supplies. That is a pure fallacy. The operations of the district (not only in respect of new business, but upkeep of the distributing plant) can no more be detached from the operations of the works than the arteries and veins in the human system can be said to be dispensable to the functions of the heart.

But what do we see? The gas industry has already sent into the country's service in connection with the war many thousands of men; and the industry is not asking for anything unreasonable in desiring that a stop should now be made to the drainage of its skilled man power. There is, however, evidence that those responsible for the building-up of as big armies as possible are intent on that end, and no other; and the gas industry will, if there is not a speedy change, have the limits of its capacity for national service drawn in much closer than they are at the present time. We commend this point to those who ask for more benzol, toluol, and other substances. It is for them to come to the aid of the gas industry. Until recently no skilled gas workers were to be allowed to join the Forces unless their employers certified that they could be spared. But the latest list of "certified occupations" only embraces skilled workmen inside the works; and the right appears to be withdrawn from the engineer or manager of saying whether or not he can dispense with the services of a man. Some of the members of the technical staffs of gas-works and some of the workmen are authorized to wear the war service badge in connection with the recovery of toluol; but the work of these men is in reality of no more importance to the country than is the work of other men engaged in the several necessary contributory manufacturing processes and those engaged in carrying on the work whereby the gas and other products are disposed of. The washing of gas for the extraction of toluol is simply an intermediary, and not a fundamental process, but one over which, of course, great care has to be exercised. If toluol were the primary product of a gas-works, all the rest of the work that is now done would still be necessary to efficiency and economy in its production. Therefore, unless prompt action is taken, it is quite clear, from decisions in some localities, that very few unbadged gas-workers will be exempted from military service; and, from a statement in the House of Commons recently, it has been made known that the number of reserved trades is to be reduced, and so are the lists of the badged men. The gas industry will not be spared—though, as Colonel Winston Churchill would put it, its work ought tc be carried on at "full blast" in the national interests—without urgent and successful pressure be brought to bear in the proper quarters to secure the total exemption of the skilled and technical workers remaining to the industry, or, at any rate, to obtain the restoration to employers of the right of saying whether a gas-worker is indispensable. Anyway, a very serious national responsibility rests upon those who are depriving gas undertakings of further men; and in saying this we are not asserting more than the conditions warrant.

Train Lighting and Uncorroborated Evidence.

The report of Lieut.-Col. P. G. Von Donop upon his inquiry into the circumstances attending the railway collision, near St. Bede's Junction, on the North-Eastern Railway, on Dec. 17, has been issued. Following precedent, gas lighting on trains is again condemned, and electric lighting is recommended. This sort of thing (though evidence time after time is most conflicting) is becoming quite a fetish with the Railway Inspectors of the Board of Trade, while the Inspectors engaged in the work of other Government departments do not appear to trouble themselves, though faced by a long roll of fatalities, regarding the expulsion from mines of electricity used for power purposes, with a recommendation that its place be taken by compressed air, or from factories and workshops, with a proposal that other forms of power, with fewer mantraps associated with them, should be adopted. But though the Board of Trade Inspectors on every opportunity of a railway accident and a fire on a train reiterate their standing recommendation, we still wait for one of them to urge that this matter of the alleged contribution of gas to train conflagrations after accidents should be made a matter of competent technical investigation. It cannot be expected that men, with a military engineering training and experience, can have a complete knowledge as to what happens in the case of gas escaping from high-pressure cylinders when broken open or with the connections violently detached. It would be only fair to the railway companies

and to all interests if, before the Board of Trade press this matter further, such an investigation were made.

There has been careful perusal of Lieut.-Col. Von Donop's report and the evidence that was put before him; and, we say with all respect, that it is impossible to subscribe to the statements that "the evidence that the fire [in this instance] originated with gas is more definite than in any "previous case," and that "it furnishes a very conclusive "object-lesson as to the additional danger which is caused "in the case of an accident by the presence of gas on the "train." It is a bad practice (and very few intelligent people adopt it) to always accept statements at their face-value. Bearing this in mind, it is well, before accepting as final Lieut.-Col. Von Donop's view, to look into the character of the "definite evidence" and the "conclusive object-"lesson." Taken as a whole, the evidence is peculiarly contradictory; and there is an entire absence of corroboration of the particular part upon which the Inspector mainly relies. As a matter of fact, it was the only piece of testimony that could at all support the conclusions arrived at, and therefore the condemnation of gas, and the recommendation as to electric lighting. The Inspector says: "The "evidence appears" ["appears" does not suggest conclusiveness, and the evidence is that of one witness out of several] "to point to the fire in this instance having origi-"nated with the ignition of a jet of gas which was escaping "from one of the gas-cylinders [which gas cylinder?] of "one of the leading vehicles [which of the leading "vehicles?]; that this gas-flame then set light to the "wooden upper portion of that vehicle, and that that in "turn set light to the inflammable portions of the two other "vehicles which were lying near it." Why on earth did not the jet of gas actively commence its nefarious work upon the oil-impregnated woodwork under the carriage, instead of going out of its way to begin destructive operations upon the wooden upper portion of the vehicle? The conditions, taking them in their entirety, are most peculiar upon which to place definiteness and conclusiveness. The witnesses differed as to which of the two wrecked vehicles was the one where the fire started. Some witnesses stated, too, that the fire had its origin under one of the carriages; while another alleged it began at the top. The Inspector himself dismisses the statement as to the top, but reports that it was the "upper portion" of one of the leading vehicles that caught fire! If we turn to an earlier part of the report, he mentions that "the whole of the upper portion "of the leading vehicle and the front portion of the second "vehicle were subsequently consumed by fire." Yet the fire is alleged to have been started by a gas-jet from one of the cylinders situated well up in the framework under one of the carriages; but nowhere is it stated that the lower part of the woodwork of the carriage was destroyed.

The evidence all appears to confine the start and the intensity of the fire to the leading vehicle, the rear portion of which was telescoped inside the second one. The testimony upon which the Inspector has relied is that of Driver Tolliday (who seems to have been extremely busy in various ways during the awful experience, and deserves all the praise that the Inspector bestows upon him). He was travelling in the second vehicle; and he says that, when working, after the accident, rescuing passengers from the next compartment to his own, it "*seemed*" to him "the fire broke "out at the gas-cylinder immediately under the compart-"ment at which we were at work." After this "seeming," he became more emphatic, and said: "I saw a small jet of "fire rising from the top of the gas-cylinder." Now this must have been under the second vehicle; yet it was the first one in which, the evidence shows, the fire burnt with the greatest intensity, and the one which suffered most. We credit Tolliday with giving his evidence quite honestly, and with believing that he actually saw a jet of flame coming from one of the gas-cylinders. Nowhere in the report, however, is the cylinder positively specified from which this jet of flame was supposed to be issuing. Tolliday did not denote it particularly; but his evidence would suggest that it was one of the cylinders under the second vehicle. There was only one of three cylinders—10 cubic feet capacity at atmospheric pressure (only one of this size would be required with incandescent lighting) left intact on the front vehicle; and in this case all the connections were broken. The pressure of the gas in the cylinders on this coach was probably about 75 lbs. per square inch! The cylinders on the second vehicle were all intact, except the leading right-hand one, which had a connection broken; but the low-pressure pipes were all severed. It is really a bit of a mystery as to the exact location of the "small" jet of fire, if actually occasioned by gas. It may have arisen from something else burning on top of one of the cylinders. Anyway, it would be interesting to know whether Lieut.-Col. Von Donop himself traced in the top of one of the cylinders a perforation where a small jet of gas could have been burning. If the gas had not escaped, then, with the connections wrenched off, it is curious that other similar gas-jets were not seen. Another thing against the gas theory is that the fire does not appear to have occurred promptly after the accident. Quite an appreciable time, according to some of the witnesses, elapsed before fire broke out, whereas the ignition of gas would more likely have taken place immediately (if at all) upon the accident, and not after an interval, when the gas would have been largely, if not entirely, dispersed. Then the flame would have attacked first the oil-impregnated wood in its proximity, and not first, by some mysterious means, the upper part of the woodwork. Instead of the evidence being "definite" and this a "conclusive object-"lesson," it is one of the most extraordinary pieces of inconclusiveness that could possibly be presented.

In this case, Lieut.-Col. Von Donop says that, in some railway accidents that have been accompanied by fire—such as those at Witham, Grantham, Hawes Junction, and Ditton—it was found that the fire had originated with escaping gas. But Major Pringle, in his report on the Hawes Junction disaster, said: "This is actually the *first* "*occasion* when it can be proved beyond question or doubt "that fire was occasioned by burning gas. It has to be re-"membered, also, that gas has been in use for lighting pur-"poses for a very long period, and that during the whole of "that time—in fact, since the year 1868—there is no case "of fire destroying either the lives or bodies of passengers "in railway accidents." In his report on the Ditton Junction disaster, Lieut.-Col. Yorke said, in fairness to the London and North-Western Railway Company, that gas had been in use upon their trains for thirty years, during which period 2937 million passengers had been carried; and this was the first occasion on which it had been suggested that gas had been concerned in burning one of the Company's trains. In all the cases mentioned in the present report, there was room for considerable doubt as to the fires having "originated" with gas; but, over the last three years, the Inspectors of the Board of Trade have shown a consistency of belief in regard to this matter on the most unreliable of evidence—evidence having its origin under conditions that could not possibly produce certainty.

Gas-Works Coal Supplies.

Gas undertakings and electricity supply stations are variously suffering—the condition is growing acute in several cases—from shortage of coal; and this applies equally to some concerns near the coal-fields as to some at a distance. Numerous gas-works were successful last summer and autumn in considerably supplementing their stocks; and had many of these not been so prudent, they would now, through the falling away of deliveries this winter, have been high and dry for coal—in fact, we know instances where normal stocks for this period of the year would by this time have completely vanished. There are other works where, while some of the contractors are well up to time with deliveries, others are very seriously behind; and the position has become one of such extreme gravity, that some of these works will have to go on to the open market to purchase supplies at current rates. The recent bad weather has not improved matters—not only on account of the greater output of gas for heating purposes, but of the increased difficulties of transport. Owing to the weather, railways have not been able to run with even their war-reduced efficiency. Sea carriage, too, has been shortened due to rough seas, wind, and fogs. At the mines, operations, owing to the bad weather, have likewise been impeded—thus accentuating the shortage. There is no doubt, looking at the situation generally, that had it not been for the Price of Coal (Limitation) Act, there would have been witnessed a considerable rise in prices, and just at a time when negotiations for contracts are being entered upon.

District Supplies Committees.

Present experiences do not improve the outlook for accumulating stocks for next winter. These experiences will make every industrial concern—including gas, electricity, and water under-

takings—look energetically after itself in this respect. The District Supplies Committee, with the Central Committee, appointed by the Board of Trade may, however, do something to ease matters, seeing that their first duty is to ensure that munition firms and other important consumers obtain the supplies they need with as little delay and friction as possible. The supply of high explosives, and the feeding of munition works with gas and coke, make gas undertakings highly "important consumers" of coal; and the Government cannot possibly afford to allow their supplies to run short. If in certain areas the supply to gas undertakings does not improve, as a result of the District Committees, it will be necessary to make very direct and strong representations to the Government regarding the matter. Of course, the coalowners have a big incentive to work for the home demand being fully met; for they have been informed that the issue of export licences depends very largely upon the condition of the home supplies. At the same time, it must be recognized that some interference with the normal distribution of coal cannot be altogether avoided. We remarked that the newly appointed District Committees "may" do something to ease matters. The indefiniteness of "may" is necessary, as the powers of the Committee appear to be very limited; seeing that the notification of the Board of Trade states: "It will probably be necessary for the Committees, from time to time, to ask for information, in the form of returns or otherwise, as to the distribution of the output, or portion of the output, of mines in their districts. Should serious objection be felt by coalowners to furnishing any particular information, the matter should be submitted at once to the Board of Trade, who will consult the Central Committee, if necessary." However, it is hoped the work of the District Committees will prove more effective than the measure of confidence we at present possess allows us to anticipate.

Wages and Man Output.

Meanwhile, the miners are again busying themselves over a further advance of wages. They lose nothing for want of asking. The Coal Conciliation Board for England and North Wales were last week considering an application for a 5 per cent. advance. On the new standard, the present rate of wages is 15 per cent., which is supplemented by a war bonus of 15½ per cent. The application is made on the ground that the market price of coal has continued to rise since the 5 per cent. advance was made last July. Owners, on the other hand, submit that the increased selling price is offset by the augmented cost of production. The consideration of the matter has been postponed until later in the month. Some interesting information was supplied by Lord Rhondda, at the recent meeting of the Consolidated Cambrian Collieries. He said that the output per man per day at all their collieries averaged about 4½ per cent. higher than in 1914, but was still some 5 per cent. below what it was prior to the operation of the Minimum Wage Act in the middle of 1912, and, of course, much below the output in times preceding the Eight Hours' Act and other restrictive legislation of recent years. The average earnings of colliers per day at all the collieries for the fifteen weeks ending Dec. 31 were 11s. 8·03d., and of all persons employed above and below ground, including boys, 8s. 11·72d. More than 12 per cent. of the men employed earned upwards of 16s. per day, or at the rate of £4 10s. per week, or (say) over £220 per annum on full time.

Extension of Women's Employment.

Almost every day one hears of some fresh direction in which women are taking on work previously done by men. In fact, on another page of this very issue it is stated that women have been engaged for the meter testing and repairing shop at the works of the South Suburban Gas Company; and they are found to efficiently perform the duties that are required of them. It is evident, however, that what is already being done is not enough—not nearly enough; for the Home Secretary and the President of the Board of Trade are desirous that prominence should be given to the fact that they are appealing to employers in the manufacturing industries to take concerted action for the purpose of making good the loss of labour caused by withdrawal of men for the Forces. While every confidence is expressed that the women of the country will respond to any call that may be made, it is pointed out in the appeal that the first step rests with the employers—to reorganize their work and to give the call. Therefore employers are urged to take two steps, if they have not already done so. First, to review the organization of their works, in order to ascertain how it is possible, by re-arrangement of work and other measures, profitably to employ, as temporary substitutes, as large a number of women workers as possible. Secondly, to send to the local Labour Exchange at once, and from time to time as the situation develops, particulars of their requirements for women labour, with the fullest possible details as to the classes of work, and the qualifications required. Emphasis is laid upon the undoubted fact that on the maintenance in the fullest vigour of the manufacturing industries of the country depend very largely the successful conclusion of the war and the continued prosperity of the nation in the years which will follow it. Employers will note that the Home Office and the Board of Trade are prepared to give them all the help in their power in maintaining output by taking on women. A strong Advisory Committee has already been appointed to help to give effect to the policy of the Government of extending the employment of women in industrial occupations; the Chairman being Mr. Cecil Harmsworth, M.P., and the Joint Secretaries Mr. F. Lavington, of the Board of Trade, and Mr. M. H. Whitelegge, of the Home Office. For the sake of the country, and for their own sakes, employers with suitable work will not allow the appeal to pass unheeded.

Municipal Motors.

That the use of motor vehicles in municipal service has been rapidly growing in popularity of recent times, must be abundantly evident to anyone in the habit of using the roads—and his eyes. But probably most people would be immensely surprised to learn the extent to which motors have now been adopted in this connection—as can be done by the study of a census which has been prepared at considerable pains by the "Municipal Journal." The information has been secured by application to municipal officers in all parts of the British Isles; and it is published in tabulated form. Remembering what an excellent fuel gas-coke is for tractors, there is considerable satisfaction to be gained from glancing through the tables. Motor-omnibuses, of course, largely swell the figures; but leaving these out of account, the number of motor vehicles in use is really remarkable, and they are for all kinds of purposes. In the case of Glasgow, for example, the total runs into three figures; the Gas Department alone being responsible for fourteen waggons, vans, and lorries. Summing up the compilation, our contemporary remarks that the question of whether steam, petrol, or electric vehicles should be adopted still remains open. While this is no doubt the case, the choice must be largely governed by the use to which the vehicle is to be put. It is admitted that steam-propelled vehicles have done, and continue to do, excellent work, often in conjunction with trailers. This is a point which, though already well known to the gas industry, it is pleasing to see published as widely as possible elsewhere. It is to be noted that many schemes for adopting motor-traction for one purpose or another are delayed or held over until after the war; and it should not be very long before there is a total absence of replies to inquiries, of the kind that were returned in a few instances on the present occasion—"My Council are not progressive enough for motors."

Coal and Coke Exports.

Bad weather and the extraordinary rates of freight have recently combined with the Coal Exports Committee to produce a lessening of the quantity of coal sent from our shores. The amount shipped in February was 3,086,695 tons, which was a reduction of 2,639,182 tons on the same month of 1914, and 542,795 tons less than was sent out of the country in February last year—3,629,490 tons. France is a better buyer than ever; and last month, with a purchase of 1,327,379 tons, it capped the figures for the pre-war February with 6612 tons, and February of last year with about 67,000 tons. A less amount is going to Italy and to most of the neutral countries. Foreign sales of coke are not doing badly. Last month 115,978 tons were exported; in February, 1915, 74,296 tons; and in February, 1914, 94,595 tons.

The economical utilization of peat in the generation of gaseous fuel, even without recovery of bye-products, is said to be to-day an accomplished fact. It can scarcely be doubted, says a writer in the "Journal of the Department of Agriculture for Ireland," that, with efficient chemical control, larger plant of sufficient capacity to deal rationally with the ammonia, tar, and other products of the destructive distillation of peat would lead to still greater economies.

PERSONAL.

At the close of the proceedings at the annual meeting of the Tonbridge Gas Company, the Chairman (Mr. W. Judd) announced that Mr. F. A. West, their Assistant Manager, had been appointed Manager of the Sittingbourne Gas-Works. He felt sure they would all join in congratulating Mr. West.

Mr. Hedley Hoy, the Gas and Water Manager to the Tyldesley-with-Shakerley Urban District Council, has been appointed Works Engineer and Manager to the Cannock, Hednesford, and District Gas Company, and will be taking up his new duties by the end of this month. It was at the end of 1912 that Mr. Hoy went to Tyldesley, previous to which time he was Assistant Gas Manager to the Lancaster Corporation.

Mr. James Gibson, Gas and Water Engineer to the Leigh Corporation, has been selected, out of 52 applicants, for the appointment of Gas and Water Engineer at Mansfield, at a salary of £500 per annum. Five candidates were interviewed by the Town Council—the choice finally falling upon Mr. Gibson. The newly-appointed Engineer, previous to going to Leigh, was Manager of the gas-works at Beverley, and prior to that Chief Assistant at Paisley. During his tenure of office at Leigh, a water-gas plant, a new holder, a sulphate plant, and vertical retorts have been installed. As Water Manager he has also had large experience.

On the 1st ult., Dr. J. J. Neurdenburg, the Director of the Utrecht Gas-Works, and one of the leaders of the Dutch gas industry, retired, on attaining 65 years of age. His direct connection with the industry dates from 1876, when he was appointed Inspector at the Leyden Gas-Works; four years later relinquishing the post to become Director of the Breda Gas-Works. At that time, he was elected a member of the Dutch Gas Association, and articles from his pen began to appear regularly in the pages of "Het Gas." He was one of the first gas men to take up the manufacture of sulphate of ammonia; and the knowledge he thus acquired was of great use to other managers when they came to adopt the process. In 1890, Dr. Neurdenburg went from Breda to Leyden as Manager, in consequence of the promotion of Heer Van der Horst to Utrecht; and in 1898, on the removal of that gentleman to Amsterdam, Dr. Neurdenburg succeeded him at Utrecht. He has held office in the Dutch Gas Association as Treasurer, as Secretary, and as Vice-Secretary; and his work for the industry has been acknowledged by his election as an honorary member. Dr. Neurdenburg is held in high esteem by gas men throughout Holland.

Alluding at the annual meeting of the Bristol Water-Works Company to the retirement [already announced in the "Journal"] of Mr. A. J. Alexander from the office of Secretary and General Manager, after 46 years' service, and his appointment to a seat on the Board, the Chairman (Mr. H. N. Abbot) remarked that Mr. Alexander's reign had been distinguished by energy, ability, and devotion to the interests of the Company, by courtesy invariably evinced, and by popularity in the city deservedly won. Besides this, Mr. Alexander had achieved a parliamentary reputation as an expert on the special legislation connected with water supply. He had been their pilot through eight successive parliamentary efforts, and eight Acts had been obtained, going from success to success. All through, Mr. Alexander had been the stand-by and the backbone of the Company; and they owed him a real debt of gratitude. Of late years, he had relaxed a little, and allowed his son (Mr. W. A. D. Alexander) to take up part of the work, so as to qualify himself as his successor. He (the Chairman) knew the proprietors would feel that the Board were only doing their duty in proposing to offer Mr. Alexander two-thirds of his salary as a pension, which would be £667; and also that they would approve of the Directors' action in offering him a seat on the Board. The proprietors having agreed to the proposals, Mr. Alexander, in returning thanks, said it had always been his good fortune to serve under Directors who had taken the greatest personal interest in all matters connected with the Company; and it was primarily to this fact that the undertaking owed its present prosperity.

Export of German Mantles and the Dutch Gas Industry.

Writing on the 26th ult., a Dutch correspondent mentioned that since Jan. 10 Germany has prohibited the export of incandescent gas-mantles of all kinds. It appears that the reason of this measure is to be found in the shortness of ramie yarn and also of cotton yarns. The German Government have taken stock of all the yarns left in the country—leaving to the different mantle factories only sufficient yarn to meet the supply of the local market. After the contracts with other countries have been fulfilled—and this will be very soon, as all contracts were of short duration, and the prohibition was quite unexpected—there will not be much chance of Holland getting incandescent mantles from Germany. For many Dutch mantle factories this is, however, a boon, as now the supply in Holland must depend upon the local factories, which are in a position to keep on working, seeing that they have for some time covered their supplies of raw materials from other countries. Furthermore, there can for the future be no fear, our correspondent concludes, that any mantles exported from Holland will be of German origin, "which ought to be a matter of satisfaction to the British gas industry."

OBITUARY.

The Board of the Plymouth and Stonehouse Gas Company has lost another of its members by the death of Mr. H. D. Bewes.

The death is announced, as having taken place on the 3rd inst., of Mr. William Barraclough, aged seventy-seven. In 1853 the deceased gentleman entered the service of Messrs. Newton, Chambers and Co., of Chapeltown, Sheffield, rising to the position of chief cashier twenty years later. Subsequently, Mr. Barraclough was appointed Secretary of the Company; but, owing to ill-health, he was compelled to retire in 1909.

The first President of the American Gas Institute, Mr. Benjamin W. Perkins, died on the 11th ult., at Hartford, Connecticut. He was, according to the "American Gaslight Journal," born in England, but went to the States when nine years old. His first connection with the gas industry was under his father, at South Bend, Indiana, where he eventually became Manager; then he served at Altoona for ten years, and in 1910 was made Manager of the Hartford City Gaslight Company. He was a member of the National Commercial Gas Association, the Michigan Gas Association, the Society of Gas Lighting, the New England Society of Gas Engineers, and the American Gas Institute. A contribution from his pen to the "American Gas Institute News" appears on a later page of to-day's issue of the "Journal."

Practical Lessons of the War.

There will still be in the minds of readers the paper read at the autumn meeting of the Society of British Gas Industries by Mr. R. J. Milbourne, of Newport (Salop), in which he dealt with the subject of the "War on British Trade"—a matter which members agreed it was of the highest importance should be properly considered. In his opening remarks, Mr. Milbourne drew attention to a series of articles at that time appearing in the "Engineer," in which, he said, it was very plainly stated that the Germans were already taking vigorous steps to retain, as far as was in their power to do so, their own foreign trade and trade connections, even during the war, and to baulk and jeopardize ours and that of our Allies. To the good work done in calling attention to a pressing matter on that occasion, Mr. Milbourne has now added by preparing of a pamphlet giving a *résumé* of the series of "Engineer" articles on "Lessons of the War," with an introduction which he concludes by saying: "Preparation for the future of British trade must be made now—the waiting till the war is over is suicidal. Germany is now fully prepared and ready; the day the war terminates will see that country set out on a war against British trade." The pamphlet has been specially prepared for the busy man—by whom, let us add, it may be profitably studied, for it is just to him that the warning message is addressed.

Munition Tribunals.

Under the Munitions of War (Amendment) Act, 1916, the Minister of Munitions is empowered to constitute special arbitration tribunals; and these have now been formed. There are two of these bodies, with Mr. Lynden Macassey, K.C., as Chairman of both. To one of them may be referred differences relating to the wages, hours, and conditions of employment of women or of semi-skilled and unskilled men; to the other, differences arising as to wages, hours, or conditions of employment of semi-skilled and unskilled men employed in a controlled establishment on munitions work of a class which before the war was customarily undertaken by skilled labour, and as to time-rates paid for the manufacture of complete shell and fuses and cartridge cases in a controlled establishment in which this manufacture was not customary before the war. As to the ordinary Munitions Tribunals, constituted under the Acts of 1915 and 1916, it may be stated that rules made in connection with the right of appeal from decisions of the Tribunals were published in last Friday's "London Gazette." Any person convicted of an offence, or against whom an order has been made, or to whom a leaving certificate has been refused, by a Munitions Tribunal (and in all cases the Minister of Munitions) may appeal against the decision to such Judge of the High Court as may be appointed for the purpose, on questions of law or of law and fact; and the other party to the proceedings before the Tribunal may, with the leave of the Judge, or with the written permission of the Chairman, appeal against the decision on grounds of a similar nature. The decision of the Judge on any appeal will be binding on all Munitions Tribunals in England and Wales; and there will be no appeal from it.

Scottish Junior Gas Association (Western District).—Members will pay a visit to the Kilmarnock Gas-Works next Saturday, and will see there the first installation in Scotland of Dempster's intermittent vertical retorts, as well as the Wilton tar dehydrating plant. Arrangements are being made to discuss at this meeting Mr. W. Bennett's paper on "Purification." The annual general meeting will take place in the Royal Technical College, Glasgow, on the 1st prox. The final lecture of the session will be delivered by Professor Arthur Smithells, F.R.S., of the Leeds University. The meeting will be followed by the annual social, when Professor Smithells will be the guest of the evening.

GAS INSTITUTION TRANSACTIONS.

A Comprehensive Index.

THE volume of Transactions of the Institution of Gas Engineers for 1915 (produced under the editorship of the Secretary, Mr. Walter T. Dunn) has been received. We are pleased to see that the Council have adopted the suggestion made by the "JOURNAL" to utilize the opportunity supplied by the meagre amount of material for the annual volume, by presenting the members with a comprehensive index covering the technical and other proceedings of the Institution, under its present and preceding titles, from 1863 down to last year. This has been done. Had it not been, the volume by its thinness would have borne testimony to the far-reaching effects of the war; now it does so by its unusual composition, and by the considerable value conferred by the index extending over fifty-three years, together with the twelve years' separate work of the former Institution of Gas Engineers—a very worthy achievement.

Of the 368 pages comprising the whole volume, no less than 182 pages are devoted to the life-index of the organization. The compiler is Mr. Norton H. Humphrys. We do not envy him the work that he has had to do; but he has this satisfaction, that the man who had the courage, the patience, and the perseverance to take up a laborious and intricate piece of work of this kind has placed the British gas profession under a lasting debt of gratitude to him. In this index, Mr. Humphrys has accomplished a piece of constructive work which, we hope, will have its great value enhanced by being kept up in future by (say) quinquennial or decennial supplements. There is no occasion to describe the plan adopted by Mr. Humphrys in making the compilation, as members will have already seen this for themselves. But the value of an index lies in its completeness—in producing something with an intelligent appreciation of the subject words under which other persons would look in seeking for the matter they require. Mr. Humphrys has worked with a view to a really comprehensive result; and several titles that we have tested have proved that they have been amply dealt with in respect of cross references. In one or two cases we might have chosen an alternative word to one or other of those preferred by the compiler; but it would be a little hypercritical to call particular attention to these instances, as they constitute quite a minor point, and one which after all is perhaps merely a matter of choice. We have pleasure in bearing testimony to the work having been well done, and to its intrinsic value being considerable.

As for the rest of the volume, the pages bear much the usual appearance, except for the absence of papers and discussions. Right in front, we have a "Roll of Honour"—those members who are with the Forces. There are upon it only 23 names out of a total membership of 870. This is a small proportion; but it only shows how the engineering and managerial staffs of gas-works have found that their services for the country are required at home. But this small number is no index to the total contribution made by the gas industry to the country's Forces. From the junior organizations and from the rank-and-file of the industry a large number of men have gone. As a frontispiece, there is an excellent reproduction of a photograph of the President (Mr. John Bond); and the volume contains his short Presidential Address—short to suit the one morning's sitting on June 1. The reports of Committees, the annual report of the Council and the accounts, the informal discussions at the meeting on matters arising out of the war and affecting the gas industry, are included. A substantial contribution to the volume is made by Mr. Ernest Scears with his abstracts of papers published in various chemical papers. These are prepared in a useful way, which makes them decidedly of practical use, and so adds to the technical value of the volume. The Benevolent Fund proceedings, the memoirs (honoured lives have retrospect here), lists of members, associate members, &c., and composition of Committees combine to make the book bear on first glance an aspect of normal completeness. Further investigation shows that first appearances are sometimes deceptive.

The "Captive Fire" System for Furnaces.

A lecture was delivered before an audience connected with the Leeds and Bradford Gas Departments on Monday evening last week, at Bradford, by Mr. W. R. Twigg, of the Davis Gas Stove Company, on "Gas-Fired Furnaces and the 'Captive Fire' System of Heating." The chair was occupied by Mr. J. H. Barraclough (the Chairman of the Bradford Gas Committee). In introducing his subject, Mr. Twigg explained the present necessity of the fullest use being made of gas heating, in the interests of national economy. He did not think there was a way in which national resources could be more importantly economized than by the greatly extended use of gas for industrial purposes. With this in view, he urged the giving of preferential treatment for the supply of gas for such purposes; and he complained that at present he found far too little disposition among makers of gas to realize the importance of this. The whole subject of the use of gas for industrial purposes was still in its early stages. Of this fact there was no better proof than was supplied by the variety of the methods now adopted. A report of what Mr. Twigg had to say will appear in a subsequent issue.

ELECTRICITY SUPPLY MEMORANDA.

As further reports of electricity supply companies are published, interesting features, associated with war conditions, here and there project themselves upon notice. We have already mentioned points from the reports of the St. James' and Pall Mall, Westminster, and Chelsea Companies—features being that revenue and profit have fallen, and dividends naturally have followed suit. These unpleasant changes cannot be helped, owing to the higher costs for coals, wages, rates and taxes, and in other directions. But in some districts, there has been another cause operating. The lighting restrictions have meant a considerble falling-off in the sale of lighting units—the units which, through the price charged, bear the greatest financial burden—while, chiefly through war requirements, the low-priced power units have expanded considerably in output. We have an illustration of this from the Westminster Electric Supply Corporation, to whose accounts we referred a fortnight ago. While, in their case, the total output of units shows an increase, the revenue decrease is about £4080. This is due to the large addition—1,040,000—to the units sold for power and heating, while those sold for lighting purposes are less by 750,000. This of course, is not a comfortable position—the sale of an additional million of low-priced units, while three-quarters of a million of high-priced units less are sold, with all outgoings for material, labour, &c., considerably enhanced. In the case of the Kensington and Knightsbridge Company, the lighting restrictions, it is stated, have been the cause of the reduction of the units sold by 9 per cent., which entails a greater percentage reduction of net profit. The dividend in this case has been clipped down from 9 per cent. to 7 per cent. What the increase of coal and wages means is shown by the report of the London Electric Supply Corporation—the two items alone having risen from 0·5d. to 0·64d. per unit, and the total expenses of generation by some 50 per cent. The profit in 1913 amounted to £71,752; in 1914 the Company pleasantly surprised themselves by handling £93,234; but in 1915 the profit fell back to £77,687. A dividend of 4 per cent. was paid in 1914; but only 3 per cent. last year. The ordinary shareholders of the South Metropolitan Light and Power Company have, for one reason, cause to be mightily pleased with last year; for the gross revenue ascended by nearly £15,000 to £80,570, and the ordinary share proprietors, after a weary wait for a dividend, now obtain 4 per cent. The few holders of the Notting Hill Company's ordinary shares would be rolling in wealth if there were more of the shares. They are getting a dividend of 500 per cent.! But the total issue is only 27,050 shares of 1s. each; the whole of the remaining capital being in preference shares. This is a co-partnership concern; and the employee co-partners receive 8 per cent. bonus. The Newcastle and District Electric Light Company have an available balance of £30,582; but no dividend is being paid, although in 1914, with an available balance of upwards of £9000 less, 3 per cent. was paid, as against 4 per cent. in 1913. The absence of dividend is "in consequence of the abnormal conditions due to the war." We should have expected so.

Interesting Features.

Electric Pressure Testing.

Now we know why the Metropolitan Borough Councils owning electricity concerns desire that pressure-testing shall be discontinued. Mr. G. W. Keats lets the "cat out of the bag" in a letter to the "Electrical Times." He is in favour of the discontinuance of testing; and the reason is that, owing to the tug of the demand on the cables through war work, the pressure conditions are of a kind which the electricity undertakings are powerless to remedy. This being the case, we cannot see what all the bother is about. The London County Council will look charitably on any deficiencies under such circumstances; and they are not likely to take any action in the way of requiring undertakings, with a heavy war demand the pressure-depreciating cause, to improve matters. Mr. Keats urges in favour of discontinuance the "same reason that gas companies for war purposes have been allowed to vary their standard of quality." Gas companies fortunately have not varied their "standard" of quality in respect of calorific power but by a very small percentage, and what variation there has been is in regard to the luminosity of open flames, and not of the performance of the modern means of employing gas for illuminating purposes. Mr. Keats is mistaken as to gas undertakings having no restrictions placed on them as to pressure. Minimum pressures are prescribed in the Acts of all gas concerns. But, says Mr. Keats: "I know of instances where, I daresay, the pressure varies at times quite 50 per cent.; and it would appear to me that the interests of gas consumers have been neglected." This is rather a vague assertion. The "I daresay" shows that the statement is pure guesswork on the part of the author. Perhaps he will tell us, assuming a 50 per cent. variation in pressure in the street-mains, whether he thinks there would be a 50 per cent. variation in the efficiency of the tap controlled gas-using appliances.

Advertising Electric Cooking.

In connection with the electric cooking campaign, the electricians know how to advertise with the view to attract attention. They do so regardless of expense; and everything electrical is maintained in tip-top order by skilled

folks. These are sides of the matter upon which the general public are not exactly enlightened. Here are a couple of instances. There has been an electric cooking and food exhibition at Selfridge's. In the model kitchen, there have been demonstrations of the preparation of bread, cake, pastries, and other dishes; and the "dainty products" of the electric-cookers have been handed round to the public to taste. The electric appliances employed left nothing to chance in regard to heat. The type of domestic oven used could be loaded to 3 KW., the grill was rated at 1·4 KW., two boiling-discs took 1·2 KW., and the third 0·8 KW.—the oven and discs being arranged for three-heat control. The roasting-oven could be loaded to 7 KW.; and in this bread and poultry were baked. Running over to Golders Green, the Company of Electric Caterers (whoever these worthies are) have started, opposite the Tube Station, an "all-electric" restaurant. It is known as the "Refectory;" and it is stated that the list of such places is growing. The building has striking architectural and decorative features, so we learn from the "Electrical Times." On the ground floor the foyer is furnished in the Jacobean style, with refectory tables, oak stools, pewter plates, and so forth. The ground floor lounge is equipped with "Dryad" cane tables and chairs and Oriental rugs; while downstairs the furnishing scheme in the luncheon and supper room comprises oak tables and rush seat chairs. It forms, the report runs, a cosy place for luncheon, tea, or dinner, to say nothing of supper after a visit to a theatre in town. The windows are filled with cakes and sweets, prepared electrically on the premises. Meals, "cooked to perfection" in the electric kitchen, are served in dainty surroundings by equally dainty waitresses, whose dark brown dresses with art trimming harmonize with the decorative scheme. It is understood (whether this was transmitted by wireless or otherwise is not stated) that on the opening day the "Refectory" was visited by upwards of 2000 persons. Did they all have a meal? However, it is clear that electric cooking requires a lot of advertising and demonstrations to place the "merits," but not the disadvantages, of electrical operation before a doubting public. Conviction as to the merits does not accrue at a rapid rate.

Zeppelins and Electric Lighting.

"Electrical Engineering" thinks it is very wrong when Zeppelins are menacing to shut off the supply of electric current at generating stations. Our contemporary has before thought so, and said so; but the rulers of some of our important cities and towns do not appear at all impressed by the opinion. They have their own views, and their own methods as to the way of doing things, in these days, when a vain-glorious military power thinks one way of conducting war is to drop from above after dark high-explosive and incendiary bombs into peaceful homes, and so kill defenceless children, women, and men. These are uncomfortable happenings; and one of the best means of protection that can be applied against these cowards and fiends, some local governing bodies opine, is the total extinction of light. This is all very well in streets and other open public places; but really there cannot be any necessity for it inside dwelling-houses and other premises with well-screened windows. We referred last week to the proposed total extinction of the electric light at Manchester on hearing of the approach of Zeppelins, but with five or ten minutes' preparatory warning by jumping the voltage up and down. Even so, our contemporary raises the objection that to plunge suddenly into absolute darkness the streets of a city full of traffic would be in itself sufficient to produce more casualties than any to be anticipated from dropping bombs. So far as the streets are concerned, we would rather risk the dangers of darkness than be in the neighbourhood of a bomb. Such an instrument of destruction does not give one time to exercise common precautions regarding self-preservation; while in dark streets care can be taken to avoid danger. Moreover, people in electrically lighted areas are not unaccustomed to sudden extinctions of the light. We sympathize more with the suggestion that there ought not to be sudden shutting-off of the lights in theatres, music halls, &c., and particularly in hospitals. In the former, because of the risks of panic; in the latter, because of the danger to life. Our contemporary realizes that the extinction of the light in an operating theatre might result in the death of a patient. Of course, the fewer collapses of light the better; but even in theatres, music halls, and hospitals, such occurrences are not unknown where the electric light is used. It is submitted, too, that the sudden stoppage of works would introduce another risk.

To Destroy a Destroyer.

Our contemporary does not protest without suggesting an alternative. Its scheme is quite a simple one, and easy of application. A Zeppelin, it says, of upwards of 400 feet in length, should be fairly easy prey for a small fleet of aeroplanes—if they can see a thing 400 feet long, and if they have sufficient light to rise in safety. Searchlights with a concentrated beam for the former purpose, and a diffused beam for the latter, should be used. Aeroplanes should rise from well-lighted aerodromes inland as soon as the warning of the approach of Zeppelins is received from the coast. The aeroplanes would then proceed to the places which the Zeppelins will make their main objectives, and near which lines or rings of searchlights of long range and high penetrative power have been erected. Of course, this presupposes the Zeppelins have informed the aeroplanes of their objectives. When the Zeppelins appear, the aeroplanes from the inland aerodromes will rise above them, and "good-bye" to the raiders. Of course, if the searchlights have insufficient power, they will act as beacons for the enemy, and yet not illuminate the hostile air craft sufficiently for efficient attack. But the avoidance of this risk is merely a question of mirror diameter and amperes. Our contemporary winds up by saying: "If the War Office need guidance on these points, we shall be happy to give it." The War Office ought to be very grateful over this offer; but we have our misgivings.

The Testing and Rating of Lamps.

With the different methods of installing filaments in incandescent electric-lamps, the old plan of taking the measurement of the illuminating value on the horizontal plane can no longer be justified, if the newer lamps are to be credited with their maximum light-giving power. The horizontal system was all very well in the days of the carbon, tantalum, and normal tungsten lamp; but with the advent of spirally wound filaments and half-watt lamps, new conditions set in, which, to give the lamps their full due in light-giving power, demanded a different system of testing. Hemispherical candle power has its attraction, in that light is generally required in a downward direction; but for lamps one uses indoors, where there is top reflecting power, the mean spherical candle power seems to be the proper thing, though its measurement is an awful nuisance. But here again there are difficulties. The makers of incandescent electric lamps do not appear to want to relinquish the test that will give the maximum candle power to any type of lamp—that is, if candle power rating is retained. We see this from an article by Dr. Ernst Salomon in the "Electrotechnische Zeitschrift." He writes: "If we change from the horizontal or hemispherical candle power to the spherical candle power, we should have to reduce by 20 per cent. the candle power of carbon lamps and of tungsten lamps of the old normal type. Spiral lamps have been rated by some makers on the basis of mean spherical candle power; but the candle powers of other lamps would require to be nominally reduced by 20 per cent. Thus, instead of the ordinary 16-candle power, we should have to talk of a 13-candle power lamp, and so on. Half-watt lamps would require to be altered in their ratings, in so far as they have hitherto been sold on the basis of hemispherical candle power. Their nominal candle powers would probably have to be reduced by 25 per cent." The upshot of consideration of these matters is that the lamp-makers in Germany have come to the conclusion that lamp ratings should be in watts—in other words, they prefer to tell the consumers the input of current, but they do not want to inform them as to the product in light. For instance, a consumer who bought a 100-watt (so-called) half-watt lamp would be able to get approximately 140-candle power from it; with an ordinary metallic filament lamp, only about 60-candle power would be realized from the 100 watts. Thus, from the consumer's point of view a rating in watts is meaningless so far as illumination output is concerned.

The Variability of Electric Lamps.

In the course of his argument in favour of wattage rating, Dr. Salomon advances as one reason that many of the quantities referring to the work of electric lamps are variable and difficult to guarantee, under the conditions of use. As a matter of fact, he says a lamp ought to be defined by the following facts relating to it: Its voltage, its current, the watts consumed, the candle power, the watts per candle power, its absolute length of life, as contrasted with its useful life (which is usually defined as the length of time taken for the candle power to fall 20 per cent.), the changes that take place during its life in the watts consumed and the changes in watts per candle power. Many of these quantities are interdependent and a few must be omitted, in spite of their importance, when it comes to a question of marking them on the lamp. A lamp would be an interesting production with all this data upon it. Regarding the variability and difficulty of guaranteeing the lamps, Dr. Salomon says that each manufacturer must use his own discretion as to making statements about length of life and decrease of candle power, having regard to fluctuations of voltage on the mains and many other difficult factors. It ought, of course, to be sufficient to state the voltage, the candle power, and the watts consumed; but the German makers, like the American, prefer the safe refuge of watts, and watts only.

Large Compressing Plant at Cardiff.

The Cardiff Gas Company, who, over a number of years, have had very considerable experience with Keith compressors (having had in use three gas-engine driven machines, each capable of dealing with 20,000 cubic feet of gas an hour), have demonstrated their satisfaction with the system in the most practical manner. The Company have now given to the James Keith and Blackman Company, Limited, an order for a much larger compressing plant, which is intended to deal with a maximum of 100,000 cubic feet of gas per hour, at pressures ranging from 50 to 100 inches water column. To meet these requirements, the Keith-Blackman Company will supply two of their "G" size rotary gas-compressors, geared to suitable gas-engines; each unit being capable of compressing 50,000 cubic feet of gas per hour. The plant will be used for boosting purposes; and at the same time connections will be taken off the mains at any necessary points for the supply of gas to high-pressure lamps, with which the Cardiff Gas Company have been doing an extensive business.

FUEL ECONOMISTS.

By W. J. A. Butterfield, F.I.C., Assoc.Inst.C.E.

The paper on "Economy of Fuel" which Professor W. A. Bone, F.R.S., read before the London Section of the Society of Chemical Industry on Monday last week, has again drawn the attention of technical chemists to a matter which has always been uppermost in the minds of the more thoughtful of them.

It is greatly to be hoped that the paper will serve the purpose of influencing the public, and the industrial community in particular, to revise the methods by which they now consume, and more or less incompletely utilize, fuel, and impel them to seek technical advice as to how improvement can be effected in their present practices. A Committee exists, under the chairmanship of Professor Bone, having among its objects the study of the supply of coal, the use to which it is at present put, and methods by which better utilization of coal might be achieved. Unfortunately, the efforts of the best committees of inquiry in this country are commonly nullified through the indifference of the general public, who will not study lengthy blue books or official reports. Individual effort must supplement the work of any such committee, if the general public is to be influenced otherwise than by the all-compelling force of ever-increasing drafts on the pocket. Gas undertakings should be, and for the most part are, in the foreground in stimulating economy of fuel throughout the country. By economy in this sense the writer means, not so much a parsimonious avoidance of the use of fuel, but efficiency in its use. Electricity supply undertakings which have modern plant likewise fall, with many other users, under the censure of theoretical fuel economists.

The views of the academical fuel economist were well displayed in the paper which Professor H. E. Armstrong read on Feb. 16 last before the Newcastle Section of the Society under the lengthy title: "The Problems of Coal with Reference to the Complete and Provident Utilization of the Supplies and of Fuels Generally: Preliminary Discussion and Scheme" [*ante*, p. 413]. Since the two papers were presented to the same Society, though read before different sections, it would have been interesting if Professor Armstrong's paper had been open for discussion at the same time as Professor Bone's. The writer had the opportunity of making a few observations in the discussion on Professor Bone's paper, which will, he hopes, in due course be printed, with some amplification, in the Society's Journal; but there are a number of points raised by the two papers which are of particular interest to gas engineers, and could not opportunely have been dealt with in the discussion on Professor Bone's paper. The Editor of the "Journal" has asked the writer to draw attention to a few points arising out of the two papers and the general question of the economy of fuel.

Raw Coal and Soft Coke as Domestic Fuels.

Professor Armstrong would urge the Society of Chemical Industry to advocate an enactment forbidding the use of raw coal for domestic purposes—such enactment to come into force at the latest ten years hence. He does not believe that gas coke, as now made, can ever be a satisfactory domestic fuel. Hence he is asking the public to deprive itself of the right to burn coal for domestic heating while he disbelieves that the only practical alternative in the way of solid fuel now obtainable will give satisfaction. If he had intended to suggest that the proposed enactment would in effect make gas the sole domestic fuel, gas engineers might possibly have been gratified by his proposal. It is evident, however, from his paper, that he wishes the country to prohibit the use of raw coal as a domestic fuel ten years hence on the strength of his assurance that in the meantime the production of an acceptable soft coke of the "Coalite" type will have been successfully established on an economical manufacturing basis. Much may be done by Act of Parliament in compelling the public to accept novelties and put up with inconveniences of the benefit of which, to themselves or the country, they are profoundly sceptical. The last eighteen months have afforded many instances of the submissiveness to authority even of the freeborn Briton when his common sense teaches him that, in prevailing conditions, protest would be less useful than compliance; and this despite his deep and growing mistrust of authority constituted of an assemblage of mere politicians, lacking in true knowledge, good judgment, and business ability. But even the newly-engendered tractability of our countrymen would not bear the strain which the enactment proposed by Professor Armstrong would put upon it. The theorists who are foremost in condemning the public for the abuse of coal as a fuel which undoubtedly occurs, forget the substantial advantages which it presents to domestic users, in particular, over any other form of solid fuel. Gas undertakings have had an uphill fight to convince the public that gas coke is deserving of patronage, and gas coke has a distinct superiority over low-temperature coke in its greater hardness and density, which admit of it being roughly handled in transport. Low-temperature coke appeals to a certain class of well-to-do consumers, who like the pleasant glow of the fire which it affords, and are gratified by the impression that in using it they are displaying their superiority to other people. To this class of users it will always appeal; but it is very doubtful if any very large proportion of the public will accept it as a substitute for coal for general domestic use. If it could be supplied at a sensibly lower cost per ton than coal, the ordinary consumer would be tempted to adopt it. It is, however, no use shutting one's eyes to the fact that coal is a much more concentrated form of fuel than low-temperature coke, and that, generally speaking, it will cost more to convey a ton of the latter (or a given number of heat units contained in it) from the place of production to the consumer's cellar than a ton of coal (or the quantity of coal which contains the given number of heat units), that his cellar will hold only one-half or five-eighths the quantity of low-temperature coke that it will of coal, that scuttles will need filling twice as often, and that fires will need making up nearly double the number of times in the day. The householder's efforts at the present day are largely directed towards reducing labour in the household, and there can be no question that low-temperature coke gives more work in the house than coal, except that chimneys need sweeping somewhat less often. As a luxurious domestic fuel, low-temperature coke will continue to find many advocates and users, but its advantages will not outweigh its disadvantages with the majority of small householders. Domestic fuel economy must be achieved in other ways—viz., by a greatly more extended use of gas, by the adoption of more efficient types of coal fires and ranges, and by the partial substitution of gas coke for coal.

Coke Briquettes.

There is another form of solid fuel which combines most of the advantages claimed for low-temperature coke with greater density and ease of handling. This form is coke-breeze briquettes, the production of which at the present time would help to dispose of the surplus stocks of pitch. These briquettes, when made with the proper proportion of pitch from coke-breeze which has not an excessive content of ash, form a fuel which has advantages in respect of cleanliness over coal, and in respect of density and ease of handling over coke. They ignite more readily than gas coke, and give a fire which is at least as pleasant as that given by low-temperature coke. The writer thinks it not improbable that, in the near future, even a certain proportion of large coke will be crushed for the purpose of producing coke briquettes. It is a pertinent fact that the amount of pitch produced from gas-tar is rather more than would be required to briquette the whole of the breeze and coke not consumed on the gas-works itself. Economically, it would appear sounder policy to use this pitch on the local gas-works in producing a good domestic fuel from gas coke, than to transport the pitch many miles in order to use it in the briquetting of anthracite. Low-temperature coke, on the other hand, would be less suitable than gas coke for briquetting in this way. It retains a considerable proportion of the volatile matter of the coal, and the addition of pitch in order to briquette it would convert it into a fuel having no advantage in respect of smokelessness over coal. Nevertheless, since low-temperature coke yields in handling a large proportion of breeze, it may well prove desirable, wherever such coke is manufactured, to adopt means for briquetting the breeze, using as little pitch as need be as binding material, or even a non-bituminous binder.

"Waste" of Raw Coal for Power Purposes.

Passing from domestic economy of fuel to the question of economy in the use of coal for other than household purposes, it is noteworthy that, according to Mr. G. T. Beilby, quoted by Professor Bone, of the total coal used in this country rather less than 20 per cent. is used in the iron, steel, metallurgical, and ceramic industries, rather less than 10 per cent. on railways and in the coasting trade, somewhat over 40 per cent. in mines and factories, and about 10 per cent. on gas-works. Adopting another mode of classification, it is estimated that 30 per cent. of the coal used in the country is used for power purposes, and 20 per cent. is coked either in ovens or on gas-works. As to the consumption for power purposes, undoubtedly there is room for considerable economy; but the opinions of technical men as to the best way of effecting such economy will be very different from those of the academical theorists. It has been proposed time after time by some of the latter that all coal should be gasified before it is used for the production of power; the general argument being that in the consumption of raw coal in furnaces its valuable bituminous and nitrogenous constituents are entirely wasted. It must be borne in mind, however, that the term "waste" when thus applied has a relative and not an absolute meaning, and that "waste" in one direction may be more than counterbalanced by consequent saving in some other direction. If it is necessary, in order to recover certain constituents or products of raw coal, to spend more than their value on plant, labour, and material, it is obviously more wasteful of the resources of the country to effect their recovery than not.

Real waste in the consumption of coal for power purposes—due to the retention of furnaces, boilers, engines, &c., of low efficiency—will most naturally be condemned in the strongest terms by all. There is no room for difference of opinion on this score; and much influential support could be found for a proposal empowering the State to require power users to replace plant which entails an excessive consumption of coal or energy by more efficient plant. This is, however, a very different proposal from that of the theorists who would debar power stations from the direct consumption of raw coal. It is well to consider what alternatives these theorists can offer, and how they com-

pare in respect of economy with the most up-to-date methods of directly consuming raw coal for the production of power.

A modern power station consumes raw coal in boiler-furnaces in such a way that at least 65 per cent. of the heating value of the coal is utilized in the production of steam. A considerably higher proportion is often guaranteed and obtained. With high superheat the consumption of steam per kilowatt-hour may be as low as 11·8 lbs., which is the figure achieved by a very large installation in Philadelphia. This means that, in an up-to-date power installation, it should be possible at the best load to consume only about 1·15 lbs. of coal per kilowatt-hour. Actually such a result is not at present attained in ordinary working in any power station in this country. But there is no question that it is well within course of attainment; and no alternative to the present practice of generating current for power purposes by means of highly superheated steam and turbines is likely to be considered by the engineering advisers of power undertakings unless it can show a better utilization of the calorific power of the coal consumed.

(To be continued.)

TECHNICS OF FIXING GEYSERS.

By Thomas Newton, of Hereford.

The modern gas-geyser is a highly-efficient water heater which has hitherto been somewhat under-estimated; and in view of the universal and insistent demand for a cheap and ready method of obtaining unlimited supplies of hot water, it is surprising that the possibilities of the geyser have not yet been more fully realized and more keenly appreciated.

As a compact and self-contained apparatus, a geyser is capable of fulfilling the requirements of a bathroom, lavatory, or scullery; and if due regard be paid to the fixing, it would prove a veritable boon to many households. It is essentially a labour-saving contrivance; consequently, its claims are entitled to more favourable consideration than has hitherto been meted out to it. Viewed from the standpoint of a gas undertaking, as a commercial proposition, the recommendation of geysers is worthy of more than passing attention; but from the domestic point of view (particularly in these servant-problem days), a demand is already present which only needs to be intelligently dealt with. Where a hot-water circulating system is in existence, in connection with which a gas-heated circulator can be successfully installed, it is, of course, more practicable to fix one of the many efficient types of gas-heated circulators now on the market in preference to a geyser. But there are thousands of houses which cannot boast of a hot-water circulating system—good, bad, or indifferent; and in each of these cases a geyser is the one thing needful, if not the one thing indispensable.

To heat a bath of from 25 to 30 gallons of water with about 30 cubic feet of gas (a result which can readily be obtained by using a geyser) is too patent an advertisement to be lost sight of in these days. A penny a bath would be shouted from the house-tops by our electrical friends if this result could, by some turn of the magician's wand, be brought within the scope of their practical experience. It will be seen, therefore, a potent argument is thus placed at the disposal of the gas industry; and it almost goes without saying that no avoidable delay should be incurred before reaping the full benefit of this desirable business.

Some amount of discrimination is necessary as regards the type of geyser to be recommended for a particular purpose. For example, while an "open" type can confidently be recommended for bath purposes, only a "sealed" type is permissible for general domestic use, where the hot water may be occasionally required for drinking, and also for culinary operations.

Geysers made of copper are superior as regards durability and conductivity to those made of other metals; but the interior surfaces—*i.e.*, those that come into contact with the water—should always be tinned before the geysers are constructed.

In selecting a geyser, it is more economical—particularly as regards the ultimate gas consumption—to choose a large one rather than a small one. Moreover, by so doing, expectations as regards results are seldom falsified. For the protection and preservation of a sealed geyser, an inter-locking gas and water tap, a dual valve, or some other similar arrangement is essential. It is sufficient if an "open type" geyser has an interlocking pilot light. Luminous jet burners are preferable to a bunsen ring-burner, inasmuch as they obviate the possibility of any lighting-back at an air-chamber, which contingency sometimes arises with the latter type of burner.

When fixing a geyser (unless there are overwhelming reasons to the contrary) it should be placed at the foot of the bath. In this position the geyser is always in sight of the occupant of the bath. Moreover, the foot of the bath is usually situated against, or near to, an outside wall; consequently, the products of combustion can readily be conducted through it without an unnecessary amount of flue-pipe, in the event of this method of getting rid of the fumes being adopted. Further, the cold water supply is generally more available at the foot of the bath.

The geyser should be fixed with its base level with the top of the bath, or as near to it as circumstances will allow, and in such a position that the delivery spout projects well over the bath. Whether a bracket or stand is used, depends on whether the bath is fixed close to the wall or some distance from it. In the former case, a bracket, of course, will be selected; but in the latter contingency, a stand will be preferable. But in any case, the geyser should be firmly fixed on the bracket or stand (as the case may be), and this should be securely screwed in position to render it perfectly rigid.

A flue-pipe of adequate diameter is of paramount importance in connection with a geyser; and under no pretence whatever should a geyser be fixed without one. The flue-pipe should be equal in diameter to that of the flue outlet of the geyser, and it should be continued undiminished throughout its entire length. It is always better to arrange the flue to rise vertically for as great a distance as possible. If a chimney breast is in the immediate vicinity, it is a good plan to utilize it, in which case a baffler would be fixed on the flue-pipe, and a bend on the baffler (near the ceiling) to conduct the products of combustion away to the chimney. However, a chimney is not always available; so an alternative method would be to conduct the fumes along a pipe leading through the outside wall, such pipe to terminate in (1) a tee having a conical top and an open bottom, (2) an open-ended H-piece, (3) a Ewart's ventilating brick. The latter is very effective, and can be highly recommended, more particularly in cases where an outside pipe would be considered a disfigurement to the wall which happened to constitute part of the bathroom. It is permissible, though not always advisable, to terminate the flue-pipe with a cowl in the roof. But the roof must be well ventilated, even though it necessitates the fixing of one or more ventilating bricks to accomplish this. Whenever this method of disposing of the products of combustion is adopted, great care should be exercised in guarding against the possibility of the hot fumes coming in contact with adjacent roof timber. It should also be borne in mind that low roofs are altogether unsuitable for the adoption of the method under consideration.

It is a mistake to conduct the flue-pipe through the outside wall immediately above the geyser outlet, since this tends to produce a down-draught by sheer syphonic action. The presence of a baffler would certainly prevent the flames being extinguished; but the net result, in nine cases out of ten, would be equivalent to the geyser being fixed without a flue-pipe—particularly in a low-lying district. One remedy for this would be to continue the flue-pipe vertically outside the building, and thus compensate for the original error inside. But this is bad practice, and should be avoided. It is always advisable to obtain as much vertical rise as possible inside the building.

The flue-pipe should be firmly fixed to the wall by means of neat clips of strap iron screwed to chamfered rectangular wooden blocks about ¾-inch thick, which have previously been nailed in position. A flue-pipe which is temporarily fixed, and thus capable of being easily dislodged, is a source of danger, and little better than no flue-pipe at all.

The cold water supply to the geyser should be arranged to give a sight-feed (excepting the type which is provided with a dual valve); and as regards this latter, the water supply only needs connecting to its respective union joint. Whether the geyser be fixed in the bathroom or in the scullery, a water supply is invariably near at hand, in which case the geyser supply may be branched into the existing supply. But wiped joints should be insisted on for all water-pipe connections.

A condensation pipe is required for a sealed geyser, and ⅜-inch copper tubing will be suitable in every respect. This should be connected to the union provided for the purpose, and then conducted and jointed into the bath waste-pipe, or, alternatively, conducted through the outside wall and into a spout head, if there be one available. Supposing the geyser to be fixed in the scullery, it will be sufficient to conduct the condensation pipe outside to the nearest gully.

The gas supply to a geyser is all-important, and inadequacy in this respect spells inefficiency, failure, and disappointment. Where any doubt exists, it is infinitely better to err on the large, instead of on the small, side. To obtain satisfactory results from a small geyser—one (say) capable of raising water to bath temperature at the rate of 2 gallons per minute—the gas-pipe should be sufficiently large to supply gas to it at the rate of 120 cubic feet per hour. Some consumers when they see (what to them is) a comparatively large gas-pipe being laid, erroneously suppose that it is being done simply to encourage them to waste gas. It is always better to remove this false impression at once by tactfully explaining that the precise opposite is the fact, since an adequate gas supply means quick and efficient service without the waste and loss which would otherwise occur through unnecessary and prolonged radiation.

An independent gas supply direct from the meter is essential in all cases—the size of the pipe varying, of course, in accordance with the size of the geyser. For a geyser rated at 2 gallons per minute, a ½-inch pipe is the smallest that should be used; and if the distance from the geyser to the meter exceeds 30 feet, the remainder should be at least ¾ inch. Similarly, a geyser rated at 3 gallons per minute would require the next larger sizes of piping. Where iron piping is used, nothing less than ¾-inch should be entertained.

In conclusion, the installation of a geyser oftentimes involves the installation of a larger meter in order to obtain the best results, since it is manifestly impracticable to fix a geyser properly and then leave the flow of gas, in the slightest degree, restricted at the meter.

THE EVOLUTION OF THE MODERN CHARGING AND DISCHARGING MACHINE.

By H. C. Widlake, M.J.Inst.E., of the Plymouth and Stonehouse Gaslight and Coke Company.

[*Continued from p.* 531.]

The following are the points of design to which, to the author's way of thinking, the designer of these machines may turn his attention, with a view to attaining a reasonable degree of standardization (referred to last week), at no sacrifice in efficiency and no appreciable increase in first cost.

(1) In some cases the ratings of the travelling and the stoking motors respectively are very much the same, and interchangeable machines, both mechanically and electrically, may be advantageously employed.

(2) Where the design of the machine is such as to necessitate the employment of different sizes of motors for the above duty, these motors may be of the same type; and certain of their parts—such as the brush holders and brushes—may be interchangeable.

(3) The difference between the respective ratings of the above-mentioned motors is rarely so wide as to prohibit the use of identical controllers, whereby the stocking of two types of controller spares may be avoided.

(4) The question of the use of identical controllers for all three motors is well worth consideration; but the cost may be prohibitive where the hoisting-lowering motor is a small machine.

(5) The resistances used in connection with the three respective controllers will vary with the capacity of the individual motors; but there is no reason why the three resistance frames should not be built-up of the same type of unit.

(6) It is the custom of many makers to protect all three motors by the use of automatic circuit-breakers or fuses (or both) on each motor circuit; and there is no reason why the circuit-breakers and fuse boxes should not be identical in all three cases—the setting of the breaker or the rating of the fuse only being varied to suit the conditions of working.

Two *versus* Three Motors.

While the use of a separate motor for each individual motion is an ideal arrangement, and has led to the employment of an increasing number of three and four motor machines, it may be remarked that the three and four motor stoker is by no means the improvement on the two-motor machine as that machine was on the older single-motor stoking machine. The real step towards efficient and rapid working was taken, in the author's opinion, when a separate motor was fitted to the two motions of the machine which are most constantly in use—viz., the charging-discharging and the travelling motion. In this connection, it may be observed that, in speaking of the charging-discharging motion, the writer has in his mind the type of machine in which the same fire element and the same motion serves for the dual operations of charging and discharging. These motions, from their frequent use, call for a very high degree of efficiency; and, apart from all other considerations, their operation by separate motors is justified by the saving of which this practice permits in regard to power supplied to the machine and converted into mechanical form without the losses which are inseparable from the use of gearing.

So far as the raising and lowering motion is concerned, there is by no means so strong a case for the employment of a separate motor for this purpose. Compared to the constant operation of the stoking and travelling gear, the raising and lowering motion is but infrequently used; and the effect of its commercially inefficient operation on the power costs is practically negligible. The considerations which lead to the use of a separate motor for this purpose are of a purely technical character; and in some machines this gear can be clutch-driven from one of the other motions without introducing any element of inefficiency or mechanical complication in regard to either that motion or the motion with which it is interconnected.

This is particularly the case in the following machines:

1.—The Fiddes-Aldridge two-motor machine, in which the raising and lowering gear is interconnected with the charging-discharging gear on the inner frame.

2.—In the De Brouwer machines, in which (in the charging, the discharging, and the combined stoker types) the raising and lowering gear is interconnected with the travelling motor gear-box fitted on the sill-plate of the machine.

3.—In the West machine, in which the raising and lowering gear is interconnected with the travelling motor.

4.—In the Toogood (R. Dempster and Son) machine, in which the raising-lowering and the travelling motion are controlled by the same motor.

When we consider the relative intermittency of operation of the raising and lowering gear as compared to the other motions of the machine, it becomes apparent that, so far as capacity and ease of handling are concerned, there is little to choose between the three or four motor machine and the machine in which the raising-lowering gear is interconnected with one of the other motions. In the plant under the writer's charge, the first machine installed was a single-motor simultaneous type built by Messrs. Aldridge and Ranken. In the latter part of 1913, a second Fiddes-Aldridge machine was put to work; and while this machine followed the lines of standard practice, it was fitted with a separate motor for the travelling motion, fitted on the near sill-plate and driving the travelling shafts by means of worm-reduction gear.

This new machine has a capacity of 20 to 25 per cent. over the older single-motor machines of the same general type; the increased capacity being entirely due to the ease of operation which the two-motor control affords and the rapidity with which the change from stoking to travelling gear can be effected, thus enabling the machine to take up and quit its position in front of a retort in the minimum time. A master controller is used; the change from one motion to another being effected by a change-over switch. This modification is a decided success in every way, and results in greatly diminished maintenance charges; but the writer has no hesitation in stating that the capacity of this particular type of machine would not in any way be increased by the employment of a separate motor for the raising and lowering motions, while it is very doubtful whether any technical advantages would accrue from such an alteration.

A rather interesting fact is that the conversion of a standard single motor "F.A." machine to this newer type can readily be effected; and such an alteration is well worth the consideration of any engineer who finds the capacity of his existing machine taxed to its utmost—say, by retort-house extensions—and who is not in a position to consider the immediate purchase of a second machine. The machine alluded to was the first of its kind, and was built to the design of the author, so far as the travelling gear was concerned; and in order to avoid disappointment a liberally rated travelling motor was installed. This rating permitted the use of a change-over switch in conjunction with the standard controller and resistances; but experience has shown that in future machines the cost of this alteration can be considerably lessened by the use of a smaller motor and a separate controller and resistance. A safety device can be fitted to ensure that the machine cannot travel while the fire element is in the retort.

Safety Devices.

To protect the motors against injury due to the passage of an abnormal current, it is customary to fit a circuit-opening device, which comes into operation when the current in the circuit in which it is connected exceeds a predetermined limit. The device may consist of the ordinary fuse-box or the instantaneous type of magnetically operated circuit-breaker. The latter apparatus will afford the greatest amount of protection if maintained in proper condition of efficiency, and particularly in the event of a hang-up occurring in any part of the gear and suddenly checking the speed of the motor. Under such conditions a heavy current is bound to flow through the motor windings, and a very heavy resultant torque will be exerted which may easily cause considerable mechanical damage in the short time that must elapse between the increase of the current and the melting of the fuse.

The fuse is a circuit-breaker with a time limit, and cannot open a circuit synchronously with the occurrence of an overload; while the automatic circuit-breaker will operate the instant the current exceeds the figure at which it has been set. For this reason the fuse-box alone cannot be regarded as affording the maximum degree of protection; and the automatic circuit-breaker is becoming a standard fitting with these machines. Some makers not only fit a separate circuit-breaker on each motor, but supplement the breaker by a fuse-box in series with it; so that if for any reason the breaker should "stick," the motor is still protected by the fuse. The maximum degree of protection which this arrangement affords quite justifies the slight (comparative) extra expense which such an arrangement entails.

The function of the fuse-box and circuit-breaker is not so fully realized as it should be by many users of these machines, who, in a thoughtless manner, are too prone to share the view of the average operator—namely, that the fuse or circuit-breaker is just a troublesome device which, by opening at the very moment when it should keep in, interrupts the stoking operations; and engineers who would "fire" a man straight away for hanging a brick on a boiler safety-valve lever are quite unmoved at the sight of an operator holding, or tying, his circuit-breaker in, or increasing the strength of his fuse without any reference to the electrician in charge. The fuse and the circuit-breaker, either singly or in combination, protect not only the motor and its control gear, but (what is even more important) the gearing of the motion to which the motor is connected. Unless means are taken to limit the enormous torque which is the chief characteristic of the series-wound motor, great damage may result to the gearing in the event of a hang-up. It is a significant fact that it is not the motor which

suffers most, but the gearing, unless means are provided for automatically shutting-off the current at such times.

Electrical safety devices are also employed for the following purposes:

1.—To ensure that the suspended frame cannot be raised or lowered beyond the safe maximum limits.
2.—To ensure that the machine cannot be travelled while the stoking element is in the retort.
3.—To ensure that the stoking element or elements cannot be driven too far forward or brought back into the machine beyond the "home" position.

The latter device is certainly a wise safeguard against a costly accident due to a momentary lapse on the part of an operator; but so far as (1) or (2) is concerned, it seems at first sight difficult to imagine a sober operator handling his equipment in such a manner as to render these devices operative. Experience has shown, however, that these devices, extreme though they may seem, are essential to guard against the failure of the human element; and only last Christmas a serious state of affairs was caused on a provincial gas undertaking by a machine of this class being badly damaged through being travelled while the stoking element was still in the retort.

(To be continued.)

NOTES ON BYE-PRODUCT COKING.

[Communicated.]

The Use of Nitre Cake.

The proposed substitution of a portion of the sulphuric acid used in sulphate making by nitre cake, did not meet with much favour at the last monthly meeting of the Coke-Oven Managers' Association. The matter was thoroughly discussed from many points of view. Some of those who spoke had already given the process a good trial, and they did not speak very encouragingly of it. There is a vast difference between using nitre cake for sulphate making and for industrial purposes, as in the textile industry. In the latter case the acid is a means to an end, and does not form a part of the final product, Consequently, the purity—or otherwise—of the acid need not be considered at all, provided that it is of sufficiently good quality to accomplish the desired end. In sulphate making, however, the acid forms an integral part of the final product, and the quality of the acid is reflected in the quality of the finished product. In this way, by the use of nitre cake, an inferior sulphate of ammonia is produced, and the more inferior the nitre cake the worse will be the quality of the sulphate.

The Government circular gives what purports to be analyses of the sulphate made from nitre cake; but the general opinion of coke-oven people is that, with ordinary nitre cake under ordinary coke-oven conditions, such results as those given in the circular could not be obtained. And even if they could, the opinion as to the possibility of the sale of the inferior sulphate is decidedly unfavourable. As the Government has already restricted the export of ordinary sulphate, supplies are available considerably in excess of the home demand; so that it is not very likely that inferior sulphate could be sold in this country. During the last two or three years, a very active campaign has been carried on with the object of educating consumers, both at home and abroad, in the use of artificial manures. German competition has forced up the standard of sulphate of ammonia from 24½ per cent. to 25 per cent. of ammonia. Long articles have appeared in the Press advocating the general adoption of the latter standard, and farmers have been made to see the wisdom of it from the monetary point of view. And now we are asked to make sulphate with 18 per cent.—or less—of ammonia! No wonder it was asked, Why don't the Government sell the sulphate first? The vexed question of ignorant interference on the part of Government officials was again raised in this connection. It does seem strange that, after eighteen months of a war in which one of the most—if not the most—important industries is that of bye-products coking, there should be no official of the Ministry of Munitions who is a real practical coke-oven man. In other munitions industries the writer believes a similar state of affairs was in existence in the early days of the war, but it was gradually remedied. There has, however, apparently been no effort to alter the conditions in this particular respect. The author knows that there is a department of the Ministry of Munitions which deals with bye-product coking; but as far as he has been able to ascertain, the officials who run it are certainly not coking experts. Coke-oven engineers also complain that it is a gas engineer who is in touch with them with regard to the carbonization of pitch in coke-ovens. Here again, surely a competent coke-oven man can be found who is quite capable of dealing with the matter.

Mixing of Coals for Coking.

It has frequently been stated in the past that in this country very little attention has been paid to the mixing of various classes of coal for coking purposes. In America mixing is carried out on a thoroughly scientific basis. By carefully grading individual coals, it has been found possible to produce corresponding grades of coke, while the advantage also extends to the bye-product side of the plant. In this latter connection particularly, there is much scope for investigation, and indeed at the present time such mixing could be advantageously carried out. It is known that certain classes of coal produced in this country do not yield a good quality of coke, yet they are exceedingly rich in volatile matter. By careful mixing of such coal with a first-class coking coal, the advantage of an increased yield of bye-products can be obtained. Large quantities of cannel coal are still available in this country; and it would seem to be advantageous, from the point of view of increasing the production of benzene and toluene, for a certain amount of this class of coal to be used in the manufacture of coke in bye-product ovens. Various other classes of non-coking coals, but rich in volatile matter, could be incorporated in the same way. There is at the present time, in many cases, considerable difficulty in obtaining sufficient supplies of coking slack to keep the bye-product ovens going at their full capacity. There was a little time ago some talk of the Government assuming full control of the supplies of slack for coking purposes; and if this suggestion materializes, the proposal for using non-coking coals in the above manner should certainly not be lost sight of.

DETERMINATION OF PRUSSIAN BLUE IN SPENT OXIDE.

By Ernest L. Randall, Chemist, Croydon Gas Company.

Titanous chloride ($TiCl_3$), which was employed in the first case as a reducing agent for the estimation of ferric iron, and afterwards—thanks to the work of Knecht and Hibbert—for the determination of nitro-compounds, the azo-dyes, and dyestuffs, is the reagent which the author proposes to use for the above determination.

It was found that dilute solutions of potassium or sodium ferricyanide would, when treated with a titanous chloride solution of about 1 per cent. strength give first a light green colour, which, on further addition of the chloride, would rapidly deepen to an intense green, and then become a reddish brown. The change in colour until the reddish brown is first reached, was ascertained to be quantitative when a very liberal excess of sodium, potassium, or ammonium sulphocyanide is present. Not less than 0·1 gramme of the ferricyanide should be present. The requisite degree of dilution varies with the base of the ferricyanide; the potassium salt working well at about 0·6 gramme to the litre, and the sodium salt at about 2 grammes to the litre.

The titanous chloride was standardized by ferrous-ammonium sulphate solution, and 1 c.c. of the former was found to be equivalent to 0·00217 gm. of Fe. Calculation showed that the amount of titanous chloride solution used in the determination of potassium or sodium ferricyanide is exactly proportional to the amount of iron present. Thus, with the above strength of titanous chloride 15·7 c.c. would be required for 0·2 gramme of potassium ferricyanide. The results were within 0·3 per cent. of the theoretical. In some subsequent determinations the titanous chloride solution was standardized by a potassium ferricyanide solution of known strength. In all these titrations the titanous chloride is added a few drops at the time to the ferricyanide solution—the Ernlenmeyer flask containing the latter being well shaken after each addition. Towards the close, care is necessary, as the change proceeds somewhat slowly.

Potassium and sodium ferrocyanide solutions were also determined by oxidizing with a slight excess of permanganate, removing the slight excess by means of the liberal excess of sodium sulphocyanide necessary for titration of the ferricyanide formed, with titanous chloride. It was found that mixtures of ferricyanide and ferrocyanide could thus be determined—one portion giving the ferricyanide present, and another (after oxidation) giving the total ferricyanide, from which the ferrocyanide could easily be calculated.

In the determination of "Prussian Blue," the spent oxide is first extracted with carbon bisulphide to get rid of all free sulphur, and is then treated with caustic soda in the usual fashion, with the addition of a little ferrous sulphate to convert any cyanide into ferrocyanide. After filtering, any sulphide present is precipitated with lead carbonate, and removed. The solution is then neutralized, made up to a known volume, and an aliquot portion taken; the ferrocyanide and sulphocyanide present oxidized with a slight excess of permanganate of about N/20 strength; and the excess of permanganate removed by the addition of a large excess of sodium sulphocyanide, which alone may be used in this estimation. The titration is then carried out with the precautions previously mentioned. "Sutton's Volumetric Analysis" describes the precautions necessary in dealing with a titanous chloride solution.

Lack of time has prevented a thorough investigation of the method for determining "Prussian Blue" in spent oxide; but it is hoped these notes will induce others to make an investigation.

The last-issued volume of "Manuals of Chemical Technology" (London: Crosby Lockwood and Son) is No. VI.—"The Salt and Alkali Industry; including Potassium Salts and the Strassfürt Industry," by Messrs. Geoffrey Martin, Stanley Smith, and F. Milsom. This has just been published, price 7s. 6d. net. Vol. VII. of the series (nearly ready) will deal with "Industrial Gases; including the Liquefaction of Gases," edited by Mr. Geoffrey Martin, Ph.D.

THE ECONOMY OF FUEL.

Discussion at the Society of Chemical Industry.

At the Meeting of the London Section of the Society of Chemical Industry on Monday of last week, the subject of the economy of fuel was discussed.

Opening Remarks by Professor Bone.

Professor W. A. Bone, F.R.S., said he had not come so much with a view of giving a paper, because this subject was so large, and its ramifications so many, that it would be quite impossible to compress it into the scope of a paper. His intention was to open a discussion on the subject; and he did not propose to occupy more time than was necessary to put forward a few of the basic facts of the situation and to enlist active interest and support for the work of the Committee appointed recently by the British Association to consider this important subject from the national standpoint. He had already dealt with the matter at some length in a series of lectures recently delivered at the Royal Institution, which had been reported fully in the Technical Press* and would also shortly be reprinted in pamphlet form. It was much more important in regard to the task the Committee had undertaken that all interested in chemical manufacture and applications of chemistry generally should give suggestions or criticism which at this stage would be particularly helpful to the work in hand, because, unless they had behind them the driving power of an enlightened non-technical public, the labours of the Committee would be largely in vain.

National Aspect of Fuel Economy.

The national aspects of fuel economy must be considered from two standpoints: First, in view of the economic situation created by the war and the need for enforcing national economy as the best means for paying for the war, and, secondly, in view of the interests of that remoter, but nevertheless not far distant, future when our coal supply would be restricted by approaching exhaustion. It could hardly be questioned that the chief material basis for the great industrial and economic expansion of this country during the past century had been our abundant supply of easily obtainable coal, which had given us a position of great advantage over all other countries. It was also true that we could no longer claim any advantage over our two nearest competitors; and our whole economic future depended on having abundant supplies of relatively cheap coal, and also the duration of the supply of our easily workable coal seams. We had to consider how long we could continue to get coal at a cost which would not place us as a nation at a disadvantage compared with our nearest competitors. In order to appreciate the great importance of this, Professor Bone gave a number of statistics of the world's coal resources. These were given in the second Royal Institution lecture,† as were also the diagrams and curves reproduced on that occasion and again exhibited on Monday. It was, said Professor Bone, our duty to make these facts universally known and to insist upon the Government taking immediate action for systematic supervision of fuel consumption in all large areas, and also to undertake scientific investigations upon the better utilization of our coal supplies. Hitherto no scientific body of men had thought it worth while to take any action with regard to coal, and the time for action had now come. If chemists did not discharge this duty, they would have deservedly to forfeit all claim to leadership in public esteem. There was a large scope for effecting economies in the case of inefficient plant by an Advisory Board, because the statistics showed very much variation in the quantity of coal used by different plants of the same type.

Export Duty on Coal.

Dealing with the export of coal, this was a matter about which there was room for much difference of opinion. After repeating the facts and figures on this question given in his second lecture, he referred to Professor Armstrong's recent suggestion at Newcastle,‡ that a small duty on all coal raised should be ear-marked for investigation into fuel economy. To this he suggested one modification—namely, a 1s. duty per ton imposed on all coal exported would bring in £5,000,000; and the Government might well impose a duty on exported coal which could be put to the purpose suggested by Professor Armstrong. He put it upon exported coal because he thought it could stand it.

Recommendation of the Royal Commission on Coal.

Strong references were made to the fact that no action had been taken to put into force the recommendations of the 1905 Royal Commission on Coal, which had estimated that savings amounting to 30 per cent. of the total fuel at present used could be made if waste could be eliminated. What public action had the Government or scientific and industrial leaders taken since 1905 to check this waste which was known through the report of the Royal Commission?

Professor Armstrong: They could not understand it.

Professor Bone (continuing) said that the answer to his question was "absolutely nothing"—the 1905 Commission might never have reported. Scientific societies should send deputations to Whitehall to insist upon something being done; scientific leaders should not allow the government to overlook such an important matter.

British Association Committees of Inquiry.

After quoting Dr. Beilby's analysis of the coal consumption of the United Kingdom, and basing a calculation upon it which agreed within close limits,* Professor Bone discussed the procedure which has been decided upon by the British Association Committee. He said that the scope of the inquiry was found to be so wide that the Committee had resolved itself into five Sub-Committees or groups, each under a separate Chairman. The first would deal with chemical and statistical matters, including the chemical nature of coal and the character of the principal British coal seams, under the chairmanship of Dr. Dunn, of Durham. The second Sub-Committee had under its charge questions relating to carbonization, including gas-works, coke-ovens, low-temperature distillation and the products derived therefrom. The Chairman was Mr. Greiner—a large coke-oven proprietor in the county of Durham. The third Sub-Committee would deal with power and steam raising, including the organization of public power schemes. The Chairman in this case was Mr. C. H. Merz, who organized the power scheme now supplying Durham, &c. The fourth Sub-Committee, the Chairman of which had yet to be appointed, had in charge the metallurgical and ceramic industries. The Sub-Committee included representatives of the iron and steel industry. The fifth, and final, Sub-Committee was one which had been formed to co-ordinate the work of the several local Committees, such as those in Manchester, Sheffield, Leeds, &c., constituted for the investigation of the pollution of the atmosphere and the domestic production of smoke. Of this Committee, Mr. Symon, the Chairman of the Manchester Air Pollution Committee, was in charge, and he also acted as General Secretary to the main Committee. It would be the first duty of each Sub-Committee to collect all available information and endeavour to come to some judgment upon it. For instance, the Committees on the production of power, steam raising, and metallurgy would endeavour to arrive at a judgment as to the probable average efficiencies actually realized and the best average efficiencies which might be expected by the use of the best appliances and methods, and the probable margins for economy. It had been arranged that the General Committee would sit at intervals to receive and discuss memoranda from the Sub-Committees, and such as were approved would probably be referred to a Special Sub-Committee. When the work of reviewing the present state of science and practice relative to coal in various industries was completed, the Committee would proceed to consider ways and means of effecting economies. This part of the inquiry would necessarily include a consideration of how far, and on what lines, the Government might help—either by the establishment of Fuel Advisory and Central Boards, or large-scale experiments in a central fuel experimental station, or both. To enable the Committee to achieve the best results, communications and assistance were asked for, which should be sent either to Professor Bone or Mr. Symon, of Manchester. All information so given would be treated as confidential, and due acknowledgment of the source of information used in any reports issued would be made.

Matters Requiring Special Consideration.

Professor Bone then indicated a few aspects of this question which, in his opinion, required special consideration. There was great need for very much further experimental research upon the chemical nature of coal, concerning which we were in a state of great ignorance. At present our knowledge concerning combustion and distillation of coal was entirely empirical, and must remain so until we have gained that clearer insight into the real nature of the complex compounds in coal and the methods of their decomposition by heat. Concurrently with such an inquiry there should be undertaken a systematic chemical survey of the principal coal seams in the British coalfields. Coals in different seams varied in physical texture and chemical character, and also varied over one and the same seam.

Then the problem of low-temperature distillation was of great national importance, both from the domestic fuel point of view and as a source of oil for motor spirit. The use of raw coal for domestic fires and steam raising and furnaces was a barbarous custom which could not be defended chemically; and the investigation and manufacture of "semi-coke" should not be left to private enterprise, but should be supplemented by systematic investigation on behalf of the public by disinterested experts aided by substantial Government grants.

Again, with regard to carbonization, Professor Bone referred to the unsatisfactory situation in the coking industry. It was to be deplored that out of 20 million tons of coal carbonized for hard metallurgical coke in 1913, no less than 6½ million tons were treated in bee-hive ovens, involving a loss in bye-products of £2,250,000 sterling. In face of the fact that all bee-hive ovens had long since been abolished in Germany, their continuance here was a great reflection upon our industrial economics, and the Government should be pressed to give a reasonable time limit within which every bee-hive oven installation in this country should be replaced. The present position also of bye-product

* See "Journal" for Jan. 25, Feb. 1, and Feb. 8, pp. 206, 253, and 305.

† *Ibid, ante*, p. 253 ‡ *Ibid, ante*, p. 413.

* See "Journal," *ante*, p. 255.

coking ovens called for immediate action, and he would have thought that the Minister of Munitions would have established some sort of inspection and supervision of these ovens. He (Professor Bone) had repeatedly drawn attention to this and offered to organize control, but to no good purpose. There was great dissatisfaction at the scandalous neglect of this industry by the Government.

Finally, with regard to the iron and steel industry, considerable progress had been made during the past few years in utilizing surplus coke-oven and blast-furnace gases; but much remained to be done to accelerate the change. If all metallurgical processes could be concentrated on one site, enormous economies could then be obtained from the rolling mills for an expenditure of no more coal than must be charged into the coking-ovens in order to provide the necessary coke for the blast-furnace gas-producer, and coal-fired boilers in rolling mills would disappear except for the manufacture of special steels. If this were done, he estimated an annual saving of 10 million tons of coal for our present output of iron and steel.

DISCUSSION.

The CHAIRMAN (Mr. A. R. Ling) mentioned that the President of the Society, Mr. Charles Carpenter, D.Sc., was present, and asked him to open the discussion.

Mr. CARPENTER said he could not help feeling that they were face to face with a very grave situation, not only as it affected them at present, but as it affected the future of the country to which they were all so proud to belong. One feature of the statement made by Professor Bone must go home to everyone—namely, it was high time they realized that their birthright was not only liberty, but they should have something to do with the disposition of their coal supplies. Professor Bone had pointed out the great importance they played in the future of this country, and it was impossible not to agree with him that chemists should have something to say with regard to their disposal. The unfortunate thing was how to apply this practically. Professor Bone had described the attitude of the most up-to-date example of a Government department—namely, the Ministry of Munitions, under the very energetic supervision of the very energetic Minister who was responsible for it. They had been told how this Department was neglecting the coking industry; and yet it was to the Government that they must look if anything was to be done to put this matter on a proper basis. It was perfectly certain that individualism was entirely broken down in this matter, and that their present method of working was absolutely wrong, whether looked at from the simple point of view of the export of coal, which went on untrammelled and uncontrolled in any way (for a few pence per ton of coal, the supplier sent coal out of the country to those who were competing with England in nearly all industries), or whether it was looked at from the point of view of the utilization of the energy existing in the coal. From both points of view, the present state of affairs was equally impossible. He would like to support Professor Bone's suggestion with regard to the great importance of arriving at some information as to what was possible in the way of converting the energy of coal into fuel. Speaking for one of the industries which had been mentioned, he could not imagine that there was any industry in this country which knew so little of what was going on in carbonizing its coal, or was so absolutely ignorant as to what was being done and what it was possible to do, than the industry responsible for the carbonizing of coal for the production of illuminating gas. They were absolutely empirical. He did not know that any steps had been taken except of the crudest and most elementary nature to fix a goal in the direction of which they should work. There was no basis of information to guide them as to how coal should be carbonized, and as to the degree in which they were achieving the result it was possible to obtain. Also he did not think it was possible to rely upon those responsible for working gas undertakings. These people were not any different from any other manufacturers; and he did not think they would take upon themselves the responsibility of making the investigations which Professor Bone had suggested. A great deal could be done with the admirable suggestion made by Professor Armstrong—that a tax should be levied on all coal raised, such a tax to be applied for the specific purpose of protecting, if he might say so, the user of fuel in any form. It was very interesting to him, as a practical man, to have heard two practical suggestions such as had been made by Professor Bone that evening and by Professor Armstrong at Newcastle a short time ago. He could hardly realize, in listening to them, that he was listening to what was sometimes spoken of, perhaps unjustly, as the more scientific element. Professor Armstrong and Professor Bone had given two eminently practical papers as to how this matter should be put on a proper basis. As the Society of Chemical Industry, they were primarily interested in getting the best possible results from the most valuable raw material that they possessed; and, as had been pointed out, it was their bounden duty to take this matter very seriously and bring it home to the Government. It was very easy to say "bring it home to the Government;" and he quite realized that this was one of the most difficult problems with which the industry was faced. But, however difficult it might be, and whatever course they might take, it was the bounden duty of the Society to do all it could in the direction of bringing it home to the Government. With regard to the work Professor Bone had done upon the utilization of the energy of gas, like many other pioneers and investigators, he was not likely to reap the benefit which he (the speaker) felt was bound to accrue from this work. Professor Bone had set a great many people thinking as to how the energy of gas could be utilized; and it was a simple fact that in many cases it had been proved to be economical, and on a considerable scale, to substitute gas heating for solid fuel—*i.e.*, the burning of raw coal—simply by reason of the fact that the amount of heat to be put in for the article required to be heated was so absolutely susceptible to control. He knew not a few cases in which these principles, for which Professor Bone had been responsible, had been applied with a considerable amount of economy—not perhaps in the way that Professor Bone had first suggested, but in other ways.

Professor ARMSTRONG said the thing that surprised him was that those present had not risen in a body and stoned Professor Bone, out of very shame. Why should Professor Bone come there and speak of a Committee of the British Association with regard to work which the Society of Chemical Industry ought to have done years and years ago? What was the Committee of the British Association? It was really a Committee of one with power to add to its number. This Committee was Professor Bone; and he had accumulated certain men around him. The British Association was a mere thing of imagination—it did not exist except for a few hours every year; and it was a pure farce that a subject of this terrific importance should be undertaken in such a way. Were the members of the Society of Chemical Industry or were they not going to take up this matter themselves? They should not for one moment allow Professor Bone to continue this so-called British Association Committee. It should be a Committee of the whole Society of Chemical Industry. He had been told in that room only that day that the Society of Chemical Industry was not fit to be a Society for industry. It was said quite seriously. This was the position they were in. What had been done all these years to justify the existence of the Society; and were they going to do anything? Were they going forward within the next week or two and say what Lord Haldane had said must be the policy of the nation, and tell the Government what to do and then follow it up? They all knew the problem was one of great importance, upon which their whole existence as a commercial nation was at stake. There was no question of thinking of Germany in this matter, because 64 per cent. of the coal of the world was in the United States. This was the fact which was going to trouble them in the future; and it would be unnecessary to bother about the Germans. Germany might affect them for a few years after the war, because they would still be organized while we should not be organized; but Germany would not affect them very long against the terrific store of raw material which the United States had. This was merely a question of coal output; but it would be necessary to look at the matter from the point of view of the use Germany was going to make of coal in comparison with our use of it here. Professor Bone had started flameless combustion some years ago; but as this had got into the hands of the company promoter, Professor Bone was now out of it, and the whole thing was asleep. Professor Bone had been talking about earmarking a duty on coal exports; but he proposed that they should earmark Professor Bone and get him away from the task of collecting information for the British Association Committee, and set him to work doing what he, more than anyone else in this country could do—namely, develop the subject of flameless combustion. The Germans were working at this as hard as they could; and the Society of Chemical Industry would lose its standing in public esteem if it did not come forward for the protection of the public against the Company promoter, who was going to start on these soft-coal schemes—there were signs of him everywhere. People were going to lose their money on enterprises of this kind; but the problems involved could not be solved by small-scale experiments. The Society must, if it were going to do anything at all, appoint a small Committee to draft a memorial to Mr. M'Kenna, Mr. Lloyd George, and the other ignoramuses with regard to matters of this kind. Unless the Society took this opportunity at once and did something, it could not last. At all events, if it could not do anything it would not be worth while lasting.

Mr. JACQUES ABADY said there could be no dispute as to the importance of the subject which Professor Bone had brought forward; but it seemed to him that there was the other end of the aspect of the difficulties which had been mentioned—namely, the end which did not begin with the chemist but which began with the public. It must be somebody's function to see to it that the public used coal only in a way that was economical. It might be said that this was a matter for which the chemist must take the whole responsibility. From what Professor Bone had said with reference to the Government attitude as to coke-ovens, it would appear almost as if the chemist was waiting for the Government to tell him what to do, instead of the Government waiting for the chemist to tell them what to do. With respect to the consumption of coal, it was an undisputable fact that coal must be used; and the use might be divided into industrial and domestic. There was, however, one essential fact outstanding very clearly indeed—that if for either of these purposes coal was being used in what might be termed open combustion as compared with closed distillation for the recovery of bye-products, then every ton of coal so used was so much money thrown away.

Therefore, was not the practical question to direct attention upon spreading the gospel of the use of coal by closed distillation rather than by open combustion, and, if necessary, to try to foster legislation or action on the part of the Central Government and local or municipal authorities which would encourage this object? This did not mean that he was preaching the gospel of the universal use of gas, because closed distillation gave rise to the production of gas and coke in addition to tar and other valuable bye-products. At the same time, they were hiding in the sand, it seemed to him, and deceiving themselves if, for instance, as had been hinted in reference to Mr. Merz's electric scheme in the North of England, it was suggested that, in utilizing electricity for power, they were doing away with the waste of coal. Unless electricity was produced by some method of combustion in which bye-products were recovered, and this combustion was applied to prime movers which were economical, they would be deceiving themselves if they thought they were being economical by using electricity. This was the whole point, and the only point to which every effort, from the Government down to the chemist, must be directed—viz., the one problem how to make the use of coal universal when the coal was employed as heat obtained by closed distillation as opposed to open combustion.

Mr. W. J. A. Butterfield, speaking with regard to the consumption of coal for power purposes, said it was all-important that the Committee should see that the machines and apparatus for the consumption of gaseous fuel should be brought to a higher state of efficiency. The central power station engineer at the present time would not look at an internal combustion engine to produce power. He was convinced that it was not reliable on a large scale to turn out power night and day. This was a matter the Committee might very well look into—namely, the reliability and efficiency of the large gas-engine. The power station engineer at present, apart from the question of reliability, might look at the matter in this way. If he proposed to gasify his fuel, he had to lose 25 per cent. of the calorific power in the carbonizers or producers. Burning this fuel in his boilers he obtained an efficiency of 80 per cent., which gave a total utilization of only 60 per cent. of the calorific power of the fuel in the boilers. With an evaporation which had been obtained in central stations of 9 lbs. of steam per pound of coal, the engineer was getting more nearly 65 per cent. of the heat of the coal consumed; and if they were to convince an up-to-date power station engineer that he would do better to go over to the gasification of his fuel, it would be necessary to improve the efficiency of the large internal combustion engine. There were other directions in which gaseous fuel machinery needed improvement. In the cement industry, about 25 years ago, the earliest rotary cement kilns were fired by producer gas. This had all gone, because it had been found that a better efficiency was obtainable with direct-firing with coal dust. He believed this was due to the improper use of gaseous fuel in the earliest rotary kilns. With regard to the solid product of low-temperature distillation, this suffered from the same disadvantage from which coke, to a less degree, had suffered—namely, that it was a very bulky product. Only half the quantity could be put into a cellar compared with coal; and this was a serious matter with small cellars in town areas. It also meant carrying two scuttles of coke to one of coal—again, a serious matter. It was on these grounds that they must look to gas as the domestic fuel almost entirely, and not to the solid product of carbonization.*

Mr. Walter Reid thought Professor Armstrong was right in the importance he attached to the British Association Committee. He did not think it would have much influence with the Government, as the British Association did not control enough votes. Far from the Society of Chemical Industry following the British Association, it was the fact that the British Association were following the Society. This matter was discussed very fully at the annual meeting of the Society in Manchester, when he read a paper on the subject; and he remembered the figures which Professor Bone had used that evening as to the production of coal, and, indeed, he had given other figures in the Society's "Journal" of July 31 last year. Important in this connection was the coal production of the Central Powers and the coal production of ourselves and our Allies. The former figure worked out at 366,000,000 tons per annum, while for ourselves and our Allies it was 411,000,000 tons per annum; so that the two were now getting very close together. This was very important because the production of high explosives depended upon the production of coal. With regard to power gas and electricity, he did not think that private enterprise was altogether idle, as very many people of great experience were at work upon it. There was a good deal called waste in work of this description which was not waste from the commercial point of view. Carriage was an important matter, as Mr. Butterfield had pointed out. With regard to the utilization of coal for the production of heat, the cement industry was an important one; and the production of power from pulverized coal was being experimented with at the present moment. If these difficulties could be surmounted, then the use of gas would be done away with altogether. Anything that could put a stop to the domestic consumption of coal in the open grate would undoubtedly be a great national advantage. He was glad that so much good work was being done in this direction at Manchester and elsewhere. At the same time he would like to point out that the original work of this description was started by the Coal Smoke Abatement Society, which had very largely resulted in the elimination of those dense fogs hitherto so frequent in London. He agreed with the suggestion of an export tax on coal, to be ear-marked for experimental purposes.

Dr. H. A. D. Jowett thought the industry must take cognizance of the fact that there was much to be done in educating not only the Government but the public generally as to the best use of coal. All those who had tried to introduce other forms of heating than open grates in their houses knew the difficulties to be contended with from the other members of the household. He was surprised that such little progress had been made in this country with steam or hot water heating, either by gas or coke furnaces, although, of course, our houses did not lend themselves to this very well, while the climate was not particularly adapted. It was now many years ago that a central station power scheme for London was talked of; but had the chemical industry done anything to make their authority felt? It was a serious matter for manufacturers around London to obtain cheap power, although recent events had rather changed their ideas, and made them feel that it would not do to rely upon one large power station for London.

Mr. R. H. Clayton suggested that more good would be done by a little less talking against the Government and more work on the part of the industry. The Manchester Committee on Air Pollution had shown what could be done.

Mr. C. A. Klein asked what the industry had done since last year to take definite steps to tackle this question? Did the Council propose to send Professor Bone's and Professor Armstrong's papers to each section for discussion, for those sections to reply to the Council stating their conclusions, and for the Council then to bring the matter before the next general meeting of the Society and state positively whether it would take any definite action or not? Professor Bone had told his story on several occasions, and Professor Armstrong had been talking in the same direction for many years; but very little had been done from the chemical point of view.

Professor Bone, who interposed at this stage as he had to leave the meeting, said he really did not care in the slightest as to the question of priority in bringing this matter forward, nor what label was attached to the Committee and the men who had set themselves to find out the facts of the situation. The Committee included men who were really going to take the matter in hand in a thorough manner, and they did not care by what name or title they were spoken of—they were going to do the work. Reference had been made to the electrical arrangements in London; but he regarded them as a disgrace to a civilized community. In an area comprising 7¼ million people, there were 65 separate authorities supplying electricity upon 49 different systems, from 70 generating stations, containing 585 engines, and distributing at 55 voltages to the consumer, who was charged upon one or other of 70 rates and prices. The average size of the generating stations was 5285 kilowatts, and the average size of the generating units only 632 kilowatts. These included many reciprocating engines; and some of the stations even had to cart their own coal. He did not consider this either modern or economical or showing any sign of progress whatever. Even the largest engine used to generate electricity, and the load factor of it, was uneconomical compared with the conditions in Paris, Berlin, or New York. There was nothing in London which came within ten years of what was realized elsewhere; and he could not agree that London could be held up in any shape or form as an example. The subject needed to be thoroughly discussed, not only as it had been that evening on the spur of the moment, but it was necessary for everyone to put his views, after due consideration, in writing, because this would be most valuable to the work of the Committee and the men with whom it was associated.

Mr. S. O. Neville, rising as a member of the brewing industry, spoke of the great field for economy in coal consumption, and mentioned that he himself, who knew nothing about the matter at all, had in one case been able to reduce the amount of coal burnt from 90 lbs. per barrel to 50 lbs.; while if the installation had been properly laid out in the first place, the amount need have been no more than 30 lbs. He was quite prepared to believe that an expert would have obtained still better results. The difficulty, however, was that smaller undertakings of this description could not afford to have an engineer on the premises; and he suggested that the Home Office factory inspectors should be reinforced by several engineers whose business it should be to give information of the character mentioned to small factory owners, and test their fuel consumption.

The Chairman, in proposing a hearty vote of thanks to Professor Bone, said that everyone seemed to be agreed that we were utilizing fuel in a very indifferent manner, and perhaps he might ask the President to be kind enough to carry out Professor Armstrong's suggestion and request the Council to form a small Committee of the Society to deal with the matter.

* The first portion of an article giving the further views of Mr. Butterfield on this subject appears elsewhere to-day.—Ed. J.G.L.

We are pleased to learn that Mr. John Holliday has been promoted from Corporal to commissioned rank, and is a Second Lieutenant in the Royal Engineers. Lieutenant Holliday, it may be remembered, after being wounded in France, spent some time in hospital in this country towards the end of last year.

AN AFTERNOON AT LOWER SYDENHAM.

A Machine for Loading Coal into Trucks.

For the third time, last Saturday afternoon members of the London and Southern District Junior Gas Association were made heartily welcomed at the Lower Sydenham works of the South Suburban Gas Company. The fact that only two years had elapsed since the last visit detracted not at all from the interest of those present in all they saw; nor, it may be added, did it lessen in the smallest degree the cordiality with which they were received. At the present time, a visit to the works was particularly appropriate; for they are the property of the Company in whose service is Mr. S. B. Chandler, the President of the Association. About forty members turned up; and with so many willing guides available, it was possible to arrange parties of such dimensions that everyone was able to put such questions as arose, and hear the explanations and descriptions which were given of the different appliances about the works. Consequently, a thoroughly profitable and pleasant afternoon was spent—a fact which was made evident at the subsequent tea, when the Directors of the Company and the Chief Engineer (Mr. S. Y. Shoubridge) were heartily thanked for their kindness in throwing the works open once more, and receiving the Association so hospitably. On arrival, the different parties were taken in charge by Mr. F. G. Gorman (the Works Superintendent), Mr. A. V. Hendrickson (Chemist), Mr. W. G. Waller and Mr. G. Ross (Employee Directors), Mr. K. Gandon, and Mr. J. Dickenson.

As before, one of the many features of the works proved to be the cleanliness and orderliness observable, although, admittedly, this is, what with labour shortage and bad weather, not a time when gas-works are at their best. How well machinery can be kept was shown at the very start of the tour in the booster-house, from which gas is sent at 36 inches pressure, by means of a special high-pressure main, to Bromley, about 4½ miles away, to be distributed from there to various areas. For this purpose, there are three exhausters; and there is, in addition, a booster—a steam turbine direct coupled to the fan—for maintaining the pressure in the mains, when necessary, in the Sydenham district. The first of the three retort-houses visited was the inclined house—what is known as the "Shoubridge House," because the ten beds of seven 20-feet retorts are filled by means of the well-known Shoubridge charging machine, and emptied by the aid (when help is required) of the Shoubridge discharger, instead of resorting to the customary "tickling" process. The charger consists of a big radius shoot, which gives an impetus to the coal; while the discharger is a ram so geared as to be very easily worked by the turning of a handwheel—the operation, in fact, taking less than a minute. As to the economy of the house, it may be pointed out that one man only is needed on the charging stage; and he could look after several more settings, if it were practicable to extend the house. Twelve-hour charges of 12 cwt. are worked; the capacity of the house being 1,100,000 cubic feet per day. The other two houses are fitted with De Brouwer stoking machinery. In one case it is worked by electricity generated by gas-engines and dynamos, and in the other by compressed air. Twelve-hour charges are worked, with practically full retorts. In the electrical house, 260 22-feet horizontal retorts have an output of 4,600,000 cubic feet per 24 hours. An endless De Brouwer chain conveyor removes the coke, which is loaded direct into railway waggons or placed in the yard. The coal is brought to the house in railway trucks, emptied into an elevator, and taken into overhead hoppers. The other house contains 186 20-feet horizontal retorts, and has a capacity of some 3,000,000 cubic feet of gas a day. Here, again, the coke is removed by a De Brouwer conveyor; and there is an excellently arranged plant for delivering it direct into railway waggons.

In connection with the coal-handling, the visitors were able to see a machine which was a decided novelty for them. In fact, while largely employed in collieries in this country, it is believed to have been the first appliance of its kind to be put to work in an English gas-works, though since it was purchased a similar machine has been installed on the Tottenham Gas-Works. It is the Jeffrey waggon and truck loader—an American machine, the English agents for which are Messrs. Hugh Wood and Co., Limited, of No. 65, Fenchurch Street, E.C.—and it is designed for loading coal from stacks into trucks, waggons, or carts. It can also be employed for loading coke into waggons. The whole thing is self-contained, and self-propelled; the driving power in this case being a small petrol engine, though an electric motor can, of course, be substituted. The machine consists of a portable bucket elevator, attached to a boom, hinged in the centre, which can be lowered when moving from one place to another. It has a radius of about 20 feet from the waggon being loaded into; and the nominal handling capacity on large heaps is about 1 ton of coal per minute. The buckets, after elevating the coal, tip it into a shoot, which directs it into the waggon. The elevator is operated independently of the travel of the machine. The arrangement is found to be a very efficient one; three men by its aid doing the work roughly of nine men. The quantity of coal handled at the works is about 130 tons per day of six or seven hours; a truck being loaded in something like ten minutes. When put into the waggons, the coal is taken by the Company's locomotives to the retort-house. There is provision on the top of some of the machines of this type, when intended to deal with coke, for screening the coke, and hoppers from which it can be bagged.

Some time was spent in the brick-making department, in which the Company make the whole of the fire-bricks they require; the method being to utilize, in about equal proportions, old material, ground and sifted, and new clay. Bricks and blocks of all shapes and sizes are made here; and even retorts have been quite successfully turned out. The facilities afforded by the large moulding-shop, of course, enable the staff to secure promptly any experimental shapes of brick; and, in addition to this, the department has much to recommend it from an economical point of view. One man, and sometimes two, can make all the bricks, &c., that are needed. Near by the visitors saw again how small things as well as big receive the most careful consideration in these works; for they were able to inspect a sample of the first-rate non-conducting composition for steam-pipes, and similar uses, which it has for some time past been the custom here to make out of waste paper, suitably treated, and mixed with some horse hair, and a little clay.

Reaching the stove shops, the members were taken in hand by Mr. Rix, the foreman, who showed them the Bower-Barffing retorts, and the chamber in which the grease is burned off the cookers. In this oven, the cookers, with the enamel linings, are subjected for three hours to a temperature of from 900° to 1000° Fahr.; and this removes the stains from the enamel, and reduces the grease to a dust, which can be easily removed by a wire brush. The brass fittings, having first been taken off the cookers, are subjected to boiling, and then polished. Each stove afterwards receives two coats of paint, and is tested before it goes out again on to the district. As on the last occasion when they were at the works, the visitors were warm in their praise of the renovated fittings, in all styles of finish, which were inspected in the lacquering shop. A point which attracted attention while passing through the commodious cooker and fire stores was the substantial amount of space which it is found necessary to set aside for the reception of the numerous shapes, sorts, and sizes of fuel designed for the different makes of fires.

Passing from one building to another, a number of boxes filled with clay were noticed distributed about; and it was explained by Mr. Gorman that this provision had been made in view of the possibility of a bomb being dropped by air-craft on one of the mains. Tar dehydration is carried out by means of a Hird-Chambers plant; and while referring to this matter, it may be remarked that on the Cutler water-gas plant sight-seals in the seal-boxes enable one to see the quality of the tar being continually emitted from the plant. By the way, some of the carburetted water-gas plant has been put in since the last visit. At that time, there were two units of 1 million cubic feet capacity per day each, on the Economical Gas Apparatus Construction Company's system; and to these were added last year two Cutler sets of like capacity, provided with every modern improvement.

The water supply for the works is derived from an artesian well; and in this connection, again, the visitors were able to see something new, a water softening plant having been put up, of a kind that is in use by the Commercial Gas Company. Waste water from different parts of the plant is led into a boiler, into which all the exhaust steam from the various engines is admitted. The water is boiled up, bringing down the temporary hardness; and a solution of washing soda is added to reduce permanent hardness. The treated water flows into three settling tanks where the mud settles out, and leaves the treated water free, to be pumped into the boilers at a comparatively high temperature.

In the meter-shops, the parties were met by Mr. Green, the foreman, who had some interesting points to put before them. They saw in successful use a tinmen's stove moulded on the works, at a very trifling cost, in one piece of fire-brick; and there were a number of the stoves on the ground waiting to be connected-up. This does not complete the tale of articles at the South Suburban Gas-Works to which the description of "home-made" can be applied. Within the last few weeks, the work has been undertaken of turning out meter diaphragms of all sizes. The arrangements for testing meters are of a complete character; and it is the aim that each meter shall be tested about once every five years. In this department, and for soldering and general overhauling, female labour has been requisitioned to take the place of the absent men. The women are found to be quite efficient, and to master the work very quickly.

Bearing on the parts of the works that have been specifically referred to here, it may be mentioned that the Company have, roughly speaking, 68,000 meters in use, over 49,000 cookers, and nearly 19,000 fires. The quantity of coal carbonized last year was 142,900 tons, and of oil used 1,089,000 gallons; the production of gas being 2,309,649,000 cubic feet. Of the 1230 employees, 260 are now serving with the Colours. The total manufacturing capacity of the works is 12 million cubic feet per day, of which 8 million cubic feet is coal gas; and the land occupied by the works is 45 acres in extent. By the purchase a few years ago of the undertakings of the Bromley and Crays and the West Kent Companies, the area of the district of supply was extended to 98 square miles.

The inspection concluded, tea was served—Mr. Shoubridge occupying the chair—in the well-appointed Livesey Memorial Hall; many of the visitors afterwards remaining for a friendly game in the large billiard-room.

Mr. SHOUBRIDGE said it was a great pleasure to him, on behalf of the Board of Directors, to offer the Association a very hearty welcome. The Directors were very glad indeed to know that the members intended to visit the works; and both he and his staff were exceedingly

pleased to see them. He could hardly hope that in going round the works the members had seen anything particularly novel to them; but they had, he trusted, come across some things of sufficient interest to make them feel that their time had not been wasted. It seemed to him that a visit to a manufactory where working operations were going on was very interesting and very profitable. One could learn something from every place visited, even if it was only what to avoid. They did not claim to have novelties on the works; but in some respects they did things differently from other works. Members could compare what they had seen there and elsewhere, and in this way no doubt learn a good deal. Of course, at this time of stress and strain owing to the war, when men were very hard to get, and much harder to keep, and there were great difficulties in getting hold of raw materials, gas-works did not look at their best; but if they had gained any knowledge by their visit, all those connected with the Company would feel well repaid for any assistance they had given.

The PRESIDENT said the remarks of Mr. Shoubridge had served to emphasize the interest taken by the Company in the welfare of the Association. Mr. Charles Hunt, the Chairman, and Mr. Shoubridge were patrons of the Association; and Mr. Wilfrid Wastell, the Secretary, was one of the honorary members.

The SENIOR VICE-PRESIDENT (Mr. F. Pearce) proposed a very hearty vote of thanks to the Directors of the Company, Mr. Shoubridge, and his staff, for the enjoyable afternoon they had spent, and the hospitality shown them. Mr. Shoubridge had remarked that the present was not the best time at which to see a gas-works; but by what they had seen in the works very great credit indeed was reflected on the whole of the staff and the employees generally. The excellent condition in which they were kept spoke well for everybody concerned.

Mr. J. HEWETT (who seconded) said Mr. Shoubridge had told them he did not claim that there was anything particularly novel to be seen on the works. There was at any rate one thing in the inclined retort-house to which he would apply this term, and that was the arrangement for bringing about the result usually attained by "tickling" the charge. This appliance was the very thing for the purpose. It was not clumsy; and it did just what was required. He had not seen anything like it in other works. Another novelty was in connection with the waste-gas flue. He did not think there were many gas-works which could claim to show an effluent gas flue from the retort-house which had the modest colouring that they had seen there. It was very difficult indeed to detect anything in the way of redness. Having taken part in previous visits as well as that one, he had arrived at the conclusion that it would be impossible to go to the South Suburban Gas-Works at any time and find anything out of order.

Mr. WALLER, after the vote had been enthusiastically carried, suitably acknowledged it on behalf of the Company. The Directors, he said again, were very pleased that the members should be there; and he hoped, among the various appliances and processes, they had seen something which would be of use to them in the future. A very great deal of what they had inspected had been made and erected by the Company's own men, under the supervision of Mr. Shoubridge. He conveyed to Mr. Chandler the hearty congratulations of the Directors on his election as President of the Association for this year.

INVESTIGATION ON COMBUSTION IN THE MÉKER AND TECLU BURNERS.

By MARION LOWE, of Sheffield.

We recently received a communication dealing with the composition of gases in the flames given by the Méker and Teclu burners. Pending the time when we are able to publish the contribution in full, it may be of interest to give a brief summary of the writer's conclusions.

Gases from various parts of the flame of each type of burner were withdrawn by means of a fine-bore silica tube and analyzed. It was found that, as soon as combustion commenced, the unsaturated hydrocarbons disappeared and a large quantity of CO was found. The combustion in the upper portion of the flame was almost entirely due to CO. In the Méker burner a very great drop in the oxygen occurred in the first half centimetre above the top of the burner; and this was accompanied, of course, by a corresponding increase in CO and CO_2.

The oxidizing gases present in the flame are CO_2, H_2O, and O; the reducing gases consist essentially of CO and small quantities of H_2 due to the reversible reaction:

$$2H_2O \rightleftharpoons 2H_2 + O_2.$$

An attempt was made to determine the actual point in the flame at which the atmosphere ceased to become reducing, and began to become oxidizing; but, although unsuccessful, it was apparent that this point is reached within a very short space after combustion has started. It was also noted that the point of most intense combustion found in these experiments exactly corresponded with the point of highest temperature as found by other experimenters.

According to a "Morning Post" telegram, a Stavanger evening paper states that a Norwegian Company has been formed for the purpose of exploiting the extensive coalfields of Beeren Island, near Spitzbergen. Geologists and engineers who have investigated the deposits report that the quantity of coal obtainable is practically inexhaustible; while it is of very good quality—its heating power being, it is said, greater than that of ordinary British coal. Beeren Island is always accessible, so that it will be possible to export during the whole of the year. It is expected that there will be no difficulty in finding good harbours.

THORIUM AND ITS USE FOR INCANDESCENT MANTLES.

An article by Mr. Thurston Owens, of New York, in the "Chemical Engineer," Vol. XXII., No. 6, gives an interesting review of this subject. He remarks that at the present time 300 million gas mantles are consumed annually throughout the world—all dependent upon the supply of thorium. Some 80 millions are used yearly in the United States—double the quantity consumed ten years ago. These and other valuable facts are brought out in a recent publication of the Bureau of Mines, prepared by Mr. Karl L. Kithil ["Monazite, Thorium, and Mesothorium," Technical Paper No. 110, Bureau of Mines, Department of the Interior, Washington].

It was not until 1891, he continues, that Dr. Auer perfected his formula of 99 per cent. of thorium and 1 per cent. of cerium, which produced the highest light efficiency, and also the nearest approach to white light in colour. For 25 years the mantles used by the gas industry have been produced with this formula as a base—another of the many features of continuity and stability which characterizes the industry.

Thorium is one of the constituents of monazite sand; the others having great chemical interest but little commercial value [Whitaker]. There are numerous occurrences of monazite sand throughout the world; but it has only been mined successfully in North and South America [Kithil]. This last statement is open to question, as the deposits at Travancore, in India, have been the subject of considerable British wrath during the last few months.

"Germany, by underhand as well as straightforward methods, was steadily proceeding towards the fulfilment of her ambition to control the thorium supply of the world when war broke out." The article from which this is quoted goes on to explain how the Auer Company obtained a controlling interest in the leases at Travancore, which was nullified by an edict of the Secretary of State for India reducing the voting power of the "enemy shares," and instructing the Company to sell to all purchasers upon an equal basis. The British India sand which has reached this country [America] is reported to be far superior to the Brazilian product. The mining of monazite sand in America has been practically abandoned since 1906; and none of the large users see any commercial possibilities in this field.

In order to obtain thorium, two definite steps are necessary. The first consists of separating monazite from the other materials mined, which is done in the neighbourhood of the mine. The monazite sand is then shipped to the laboratories of mantle manufacturers, where the thorium is extracted.

"The manufacture of nitrate of thorium from monazite sand is a very difficult and complicated chemical process. It requires from four to six months to recover the small percentage of thorium and render it sufficiently pure to be used in the manufacture of lighting fluid." [Whitaker].

The treatment of monazite for the extraction of thorium described by Soddy ["Chemistry of the Radio-Elements"] is next quoted by Mr. Thurston Owens; and then he continues: In the manufacture of thorium nitrate from monazite a large amount of residues of the cerium group of rare earths is obtained. Monazite contains 60 to 70 per cent. of the cerium group or other rare earths besides thorium, and 3000 tons, which is the annual consumption of monazite, gives about 1000 tons of cerium and about 1200 tons of a mixture of the rare earths lanthanum, neodymium, and praseodymium oxides. Considerable research work has been done in order to utilize these waste materials; and experiments have been made with almost every one of them. In order to obtain and separate the rare-earth elements thousands of crystallizations and fractionations are necessary, although cerium itself is separated with comparative ease. The untiring work carried on in the research laboratories of the industries as well as by the scientists in both America and in Europe will no doubt in time be crowned with successful technical applications of the bye-products.

The monazite resources are given by Kithil as follows: It is difficult to form even a rough estimate of the quantities of monazite obtainable in the various countries. From close calculations, however, it is estimated that the lands in the marinhas along the seacoast of Brazil may yield from 15,000 to 20,000 tons of pure monazite. This does not include coast lands, where the deposits have been formed in comparatively short time. In the interior of Brazil the writer knows of 18,000,000 acres of monazite-bearing gravel deposits, which should yield monazite containing 4½ per cent. of thorium oxide; and it can be estimated that these gravels contain 45,000 to 60,000 tons of monazite. No doubt there will be found many other deposits of greater or less extent in the interior of Brazil; but no single deposit in the interior, so far as known, would warrant the erection of large plant. In sections where several large deposits are found together or near each other, a washing and concentrating plant might be profitably established, provided the price for the monazite obtained were higher than at present, and especially if transportation facilities from the interior to the coast become better.

The amount of purified monazite available in the Carolinas may be conservatively estimated at about 15,000 to 20,000 tons (4½ per cent. ThO_2). With better methods of mining and re-

fining perhaps these deposits could be profitably exploited at the present prices for monazite and thorium nitrate—especially if the mining of monazite were carried on in connection with the manufacture of thorium nitrate and mesothorium.

It is known that attempts have been made to extract the monazite from the native rock, but this operation with even the richest rock known—0·1 to 0·2 per cent. of monazite—has proved too expensive.

In view of the increased price of thorium, the "American Gaslight Journal" has obtained expressions from several of the large users of thorium regarding changes in the tariff that would forestall any increase in the retail price of the gas mantles. The opinion seems to be general that as long as the American mantle-makers can obtain monazite sand from abroad, the prospects of using American deposits are doubtful. On the other hand, a reduction in the tariff on sand, and an increased duty on the finished mantle, would do much to stabilize the industry. As an incentive to American manufacturers the duty is hardly scientific, as it calls for 25 per cent. *ad valorem* on sand, thorium, and on mantles.

CURIOUS CASE OF A GAS-MAIN STOPPAGE.

A peculiar instance of a stoppage in a gas-main at Ysselsteyn, a small town in Holland, was recorded recently by "Het Gas."

One evening in November, urgent need arose to open the retort-lids, as the pressure on the retorts and the works mains had increased to such an extent that the water in the pressure-gauges had been blown out, and the water-seals in a number of syphons on the works had been broken. As the delivery of gas from the works remained normal, nothing but a blocked gasholder inlet could be the cause. On opening the holder bye-pass, the water from the meter connected to the gasholder outlet flowed to the governor. Everything pointed to a leakage in the holder inlet; and that this supposition was a right one, was demonstrated by a jet of water many feet high from the syphon when the plug was taken away. By opening the manhole in the holder outlet, it was possible to remove the greater part of the water, and the gas-way through the bye-pass became free again; the work having been performed in so short a time that the public lighting in the town had not suffered. Careful inspection revealed the cause of the occurrence. The holder is constructed on a concrete bed-plate; and this foundation had given way unequally, with the result that the holder had shifted, and the crown had then thrust aside the gas-inlet pipe, and broken it. As the same fate might overtake the outlet pipe, the urgency of repairing was obvious; but, before everything, it was important to have all the pipes and fittings at hand—there being but one holder on the works.

The retort-house having three semi-producer ovens, one with eight and two with five retorts, was adequate for a daily output of 86,400 cubic feet. The consumption varied between 50,400 and 57,600 cubic feet; the maximum hourly consumption being about 5760 feet. For charging, there is a stoking-machine. The quest tion was how to ensure an even pressure on the governor-inlet; and for this purpose, the following apparatus was constructed. When the gasholder is bye-passed, the outlet of the station-meter corresponds with the governor-inlet as regards pressure. Therefore on the meter-outlet there was erected a 3-inch pipe with cock; the pipe rising about 3 feet above the roof. On the head of this pipe a sort of small gasholder, made of sheet iron, was placed; the dimensions being 40 inches wide and 30 inches high. At half the height of the tank, there was a small pipe for the regulation of the water-level. The bell, running on small wheels against the sides of the tank, was on the underside cut out in the form of large saw-teeth. Loaded with a sufficient quantity of iron bars, the bell could outbalance a pressure of 56-10ths. As soon as the pressure rose above this figure, the bell was raised, and gas passed along the saw-teeth till the pressure of 56-10ths was restored. This auxiliary governor being ready, a start was made on a Saturday night with the emptying of the tank of the defective holder. This was finished on Sunday morning; but in view of the gas remaining in it, further operations were suspended until Monday morning. That evening the new steel inlet and outlet pipes were ready on their places for the refilling of the tanks to begin.

During the whole of this time, the auxiliary governor remained under even control; and the task of the man in charge was to give instant notice to the retort-house when the pressure was falling, so that fresh charging of a retort was obviously necessary. In the hours of peak-load, after 4.30 p.m., this matter required great care, which is easily understood when it is mentioned that in one-and-a-half hours there had to be charged seventeen retorts, with only one stoking-machine, so that for each charge only some 4½ minutes were available. Nevertheless, the recording-gauges indicated normal lines.

The death is announced as having taken place at Richmond, Virginia, of Mr. Francis Thomas Glasgow, the father of Mr. A. G. Glasgow (Humphreys and Glasgow), of London and New York. Mr. Glasgow, sen., who was 87 years old, retired a few years ago from the position of Managing-Director of the Tredegar Iron-Works, with which he had been associated for sixty years. For several years he was on the Board of Aldermen of the city, and served on the directorate of the State Penitentiary.

FUEL OILS FROM COAL.

A paper was lately read before the Manchester Association of Engineers, by Mr. HAROLD MOORE, M.Sc.Tech., F.C.S., on the subject of "Fuel Oils from Coal," in which the author examined the methods at present available for the carbonization of coal, and gave a brief description of the nature of the liquid fuels obtainable, and the quantity of those which might reasonably be expected to find their way on to the fuel-oil market for such internal combustion engines as are at present being run on crude petroleum, de-petrolized petroleum, and petroleum residuum.

He said that, in addition to the tars produced by gas-works, coke-ovens, and low-temperature plants, tar in comparatively small quantities is a bye-product of gas-producers, oil-gas plants, and some blast-furnaces. The tar from gas-producers is too irregular in composition to become of much value as fuel in the immediate future. The tar from oil-gas plants is not a coal derivative, and is not yielded in sufficient quantity to become an important source of power. Blast-furnace tars are not available in quantity, and generally contain far too high a percentage of ash to be of use for internal combustion. There is little opportunity for coal-tar oils to become used in quantity for the production of power, unless the output be considerably increased. Previous to the outbreak of war, there was little difference in price between tar oils and petroleum products; and even at times when prices were most favourable to the use of tar oil, there was little advantage to be gained by employing it when the lower calorific value of this product was taken into consideration.

The oils derived from low-temperature carbonization processes have not yet made their appearance on the fuel market; but though higher in calorific value than the normal tar oils, there is no reason to anticipate any reduction in price in the tar-oil prices at present quoted. The cost of such oils is, to a large extent, due to the expense of carriage of the tar to some central distillery, and of the oil from distillery to buyer. It becomes evident that, if we wish to find a cheap fuel derived from coal, we must use the tar before the operation of distilling has increased its price.

Raw tars are at present obtainable at prices between 25s. and 30s. per ton—about half the price of the distilled product. The heavy tars yield on distillation only some 25 per cent. of their weight in the form of tar oil, from which figure we can deduce that there will be about four times the quantity of fuel available if the raw product be employed. The tars are produced in all parts of the country, thus reducing the cost of the transport—a point of great importance. Tars possess calorific powers about 16 per cent. lower than average petroleum oils, which is little lower than the corresponding values of their distillates.

From these facts it will be seen that, in point of economy, tars afford ideal fuels in a country possessing no petroleum resources, and a copious supply of coal. There are, however, difficulties met with in the burning of tars over and above those encountered in the burning of tar oils. It would be advisable, before going further with this question, to note the development that has taken place on the Continent, where the finding of substitute fuel oils has been the subject of much patient research, on account of the import taxes on petroleum having now brought the problem to a crisis at a very much earlier date than in this country. When the shortage became acute, manufacturers of the Continental Diesel engine turned their attention to tar oils as likely substitutes. Research in this line resulted in the invention of an ignition oil-pump, and the drawing-up of a specification in order to ensure the satisfactory quality of tar oils for use in Diesel engines. The successful running of tar oils led to experiments with raw tars; the result being that Diesel engines were found to give quite satisfactory running on vertical-retort tar. Attempts were then made to run engines of the constant-pressure type on inclined-retort, horizontal-retort, and coke-oven tars; and in May, 1913, Constam and Schlapfer, at the conclusion of their work on this subject, classed vertical-retort tars, chamber-oven tars, water-gas tars, oil-gas tars, and certain coke-oven tars as suitable for use in Diesel engines, providing special adaptations were used. The tars obtained from horizontal retorts and inclined retorts they considered unsuitable. Lignite tar products were classed as suitable for use without any adaptation of the engine. The author's experience has been in entire agreement with these conclusions.

A careful examination of the literature which has been published on this subject in Germany and Switzerland, together with a large amount of experimental work both in the chemical laboratory and on the engines of the Experimental Department of Messrs. Mirrlees, Bickerton, and Day, Limited, led Mr. Moore to come to the following conclusions regarding the properties required in tars to allow their use in Diesel engines:

1.—A high hydrogen content is desirable; it indicates the presence of aliphatic hydrocarbons, facilitates ignition, and minimizes carbonization inside the engine. Increase of carbon deposit would be expected with decrease of hydrogen content. If we consider the nature of flame yielded by the combustion of a low hydrogen hydrocarbon—for example, acetylene or benzene (both of which contain 92 per cent. of carbon and 8 per cent. of hydrogen)—both give very sooty flames.

2.—A low "free carbon" content is essential, as the greatest difficulty is experienced in obtaining complete combustion

Analyses of Fuel Oils.

Description.	Sp. Gr. at 15° C.	Water.	Ultimate Composition.				Ash.	Coke.	Net Calorific Value.		Free Carbon.
			C.	H.	O. and N.	S.			Calories.	B.Th.U	
Horizontal-retort tar	1·180	1·75	91·5	5·2	2·6	0·5	0·20	24·0	8,645	15,561	18·2
Inclined-retort tar	1·157	1·11	89·9	6·0	3·6	0·5	0·02	18·5	8,671	15,626	14·0
Vertical-retort tar	1·089	2·25	88·0	6·8	3·8	0·6	0·03	6·1	8,664	15,613	1·7
Otto Hilgenstock coke-oven tar .	1·208	6·00	90·0	5·4	3·8	0·8	0·02	26·8	8,624	15,523	23·9
Simon-Carvés coke-oven tar . .	1·090	0·50	88 1	5·6	6·1	0·2	0·07	6·0	9,261	16,670	traces
Chamber-oven tar	1·082	1·29	88·2	6·9	4·6	0·3	traces	7·3	8,737	15,727	3·0
Low temp. carbonization tar .	1·058	3·00	85·8	8·1	5 49	0·09	0·11	8·2	8,776	15,797	2·2
Water-gas tar	1·054	0·59	92·2	6·8	0·4	0·6	traces	18·7	8,647	15,563	6·8
Blast-furnace tar	1·172	3·0	89·5	5·75	0·55	0·84	0·36	23·4	8,288	14,918	9·5
Blast-furnace tar oil	0·974	none	87·25	9·8	2·59	0·36	none	1·05	9,243	16,637	none
Oil distilled from low temp. tar.	0·884	none	85·6	11·4	2·48	0·4	none	0·84	9,558	17,204	none
Horizontal-retort tar oil . . .	1·065	1·00	90·1	6·8	2·4	0·50	0·2	3·0	9,243	16,637	none
Pennsylvanian petroleum fuel oil	0·889	none	86·7	12·55	0·11	0·64	traces	0·60	10,108	18,194	none

and a clear exhaust when fuels rich in this substance are in use. The free carbon is a precipitate of fine amorphous carbon containing also nitrogen and oxygen, and may be considered as coke dust in an exceedingly fine state of division. It has been attempted to separate this body from the oil by numerous methods, the most successful of which was by treatment in a centrifugal machine, and found that only one-third of the free carbon present could be removed by this means. As the method is expensive and tedious, besides being ineffectual, it has never been used on a large scale. The effect of free carbon on the engine is to cause wear on the piston rings, valves, and cylinders.

3.—A high calorific power is preferable, as upon this value is dependent the work obtainable from unit weight of coal.

4.—A moderately low viscosity is preferable, as the oil must be sufficiently thin to flow through the engine service-pipes in cold weather. Low viscosity also enables a more effective pulverization—thus increasing the thermal efficiency.

5.—The fuel must contain very little water (less than 2 per cent.), as when present in larger quantities, the drops of water cause irregular running and misfiring.

6.—The coking value should be as low as possible (never over 15 per cent.), as this value is a direct measure of the liability to form deposits in the engine.

7.—The ash content must be low (not exceeding 0·15 per cent.).

From the accompanying table of properties of tars, it will be plainly seen that the tars which most closely approach the desirable qualities above set forth are those produced by low-temperature processes. The cost of such tars is difficult to prophesy, as no such product has, to the author's knowledge, been marketed on a large scale as fuel. One can, however, safely predict that such tars would be able to command a higher price than ordinary coal tars, on account of their use as liquid fuel; and in these circumstances it would not be profitable to work them for the more refined products. They would never be able to attain the price of the petroleum fuel oil. One advantage to fuel users would lie in the tendency of this competition to lower the cost of the imported oil.

The supporters of low-temperature carbonization are unanimous in calling attention to the possible yield of motor spirit; and it appears quite possible that it may be more profitable to extract this product by "topping" (as is customary with petroleum) before selling for fuel oil. It is improbable that the gas companies will adopt the low-temperature type of plant, on account of the low yield of gas; but they might be run on a small scale to enrich gas of low luminosity, as the gaseous products of the low-temperature plant are of very high candle power, if not stripped of any of their condensable contents. Professor Gray has pointed out that these processes might be used for generating electricity by employing the coke in producers, and mixing the gas from the retort with the producer gas, then burning the result in gas-engines, in which case tar and ammonia would be bye-products. The coke obtained by the low-temperature processes has been claimed to be suitable for metallurgical purposes; but there appears little likelihood of finding a successful field for its use in this direction. As no process of carbonization of coal can be successful without obtaining a suitable market for all the products, it is necessary to find some use for the coke and gas. The ammonia will, of course, find its way to the usual fields.

The yield of gas being small, it will probably be washed for motor spirit, and then burnt under the retort. The satisfactory disposal of the coke is a much more difficult problem. The yield of liquid products from the low-temperature carbonization of coal varies very much with the type of coal in use. But the processes when employing coal containing a large percentage of volatile yields large quantities of tar; and it is only upon this type of coal that any great advantage in the employment of this method of carbonization appears possible. The Premier Tarless Fuel Company, working a plant at 900° to 1000° Fahr. under a vacuum of 25 inches of mercury, obtained the following average yields of tar:

Coal Used.	Tar Yield.
Cannel (poor)	52 to 60 gallons per ton
Cannel (good)	60 to 80 ,, ,,
Slack	20 to 25 ,, ,,

Specific gravity of tar, 1·060.

This product, if carefully dehydrated, would make an excellent fuel for Diesel engines.

There is another possible solution to the fuel-oil question which has not yet been approached, and which is applicable to all types of carbonizing plants—viz., the fractional condensation of tars. This appears a cheap and economical way of obtaining ideal fuel oils. If the products were condensed in three stages—the first to contain pitch and free carbon, and the third to contain the volatile naphtha (benzene, toluene, and some xylene), the second or middle fraction would contain the products at present known to tar distillers as carbolic oil, creosote oil, and anthracene oil, together with the heavier portion of light oil. This second condensate, though probably not so well fractionated as is the case with distilled products, would nevertheless be an ideal tar oil for use in Diesel engines. Any richness in naphthalene would cause no trouble, provided the fuel service tanks were heated. The possibilities of this method of working are worthy of the consideration of gas engineers. The analysis of such a product of fractional condensation is not available; but the composition and properties would not vary much from the creosote yielded by tars obtained from similar carbonization plants.

Ignition of Gases by Electrical Discharge.

This was the title of a paper communicated recently by Mr. William Horton to the Royal Society. He considered the ignition of gases by impulsive discharge first as a function of sparking distance. It was shown that the shorter the distance the greater the spark; so that the volumes of the least igniting sparks are, in a typical case, the same for all spark lengths. Ignition may occur with intense momentary brush discharge—generally with the true disruptive spark. The products of combustion were found to be ionized and to carry a positive charge. The gases examined were mixtures in air of hydrogen, methane, propane, and pentane; of ethylene and acetylene; carbon monoxide and cyanogen; and coal gas and a mixture of equal volumes of hydrogen and methane. Hydrogen, propane, pentane, and carbon monoxide rise gradually in difficulty as the percentage of oxygen is reduced; methane is ignited by the same spark whatever the percentage of gas may be; acetylene and cyanogen have the stepped atomic type of ignition; ethylene is more inflammable in rich mixture; hydrogen and methane in equal volumes are ignited as methane in type, but hydrogen in magnitude. The limits of inflammability of the paraffins were shown to be reached—the upper limit when there is twice the volume of combustible gas to that in the mixture for perfect combustion; the lower limit when the volume of oxygen is twice that for perfect combustion less one atom to the molecule. The ignition of coal gas is through methane. Four types of electrical ignition were given, covering all from the most rapid to the slowest rate of discharge from the poles.

The "Monometer" Tinning Furnace.

With the object of decreasing the cost and increasing the efficiency of the process of coating wire with molten metal, the Monometer Manufacturing Company, Limited, of Whitehouse Street, Aston, Birmingham, have introduced a system to supersede the hitherto practised method of drawing the wire through an open pot containing the metal. Under the old plan, considerable loss through surface oxidation was regarded as inevitable; while the outstanding feature of the new system is said to be an enormous saving in residue. The melting-pot is covered by a dome-shaped casting, forming virtually a sealed chamber for the melting operation; and this chamber is supplied with inert gases from the bunsen burners under the melting-pot, so as to produce an oxygen-free atmosphere. The experience of users, it is said, is that the resultant saving in residue amounts in many instances to not less than 4s. per ton of metal melted. By means of thermostatic regulation of the burners, the temperature of the molten metal is kept constant—a very important consideration in connection with wire coating. For the supply of gas, no auxiliary mechanism is required; ordinary main pressure being utilized for the patent burner system, which comprises any desired number of bunsen burners attached to an equalizing chamber, which distributes uniformly the supply of gas to the individual burners. These latter are constructed in such a manner as, it is claimed, to produce intense heat with a remarkably low consumption of gas. There are special and ingenious arrangements for handling the wire; and any required number of wires may be coated simultaneously. Finally, the furnace is well and strongly made.

USE OF SILICA BRICKS FOR BYE-PRODUCT COKE-OVENS.

In a paper which he read at the San Francisco meeting of the American Institute of Mining Engineers, Mr. KENNETH SEAVER said it is gratifying that, though in the manufacture of refractories as a whole, foreign practice has surpassed them, the United States stands pre-eminent in the making of silica brick. In some instances, European manufacturers refused to credit the possibility of making to such specifications as are common with us, until the completed shapes were shipped for inspection. But both the manufacturers and consumers in foreign lands are now benefiting by American advanced practice in this field, as is evidenced by the orders placed there, and the efforts abroad to come up to the standard of American-made material.

In no operation has the employment of silica brick spread with such leaps and bounds as in the carbonization of coal, particularly in the bye-product coke-oven. To-day, in practically all types of oven, the structure above the floor level (except the facings) is of silica; while in the recuperative and in some regenerative types its use is extended below the oven floor as well. Because there are a number of refractories of higher silica content than the usual so-called fire-clay brick, there is sometimes a confusion as to what is meant by "silica" brick. The author refers only to a brick having a silica content of 94 per cent. or more, made usually from quartzite rock with a small percentage of lime as a binder. The term "silica" brick is sometimes rather loosely applied to brick made from highly siliceous clays, or to a quartzite refractory of mingled fire-clay and quartz rock. But such products are not considered in the paper.

MATERIALS.

The rock from which practically all high-grade silica bricks are made is a true quartzite or metamorphosed sandstone, variously known as ganister, quartz, quartzite, silica rock, &c.; the largest fields, in the order of their relative importance, being those of Pennsylvania, Wisconsin, Alabama, and Colorado. Pennsylvania manufactures from 75 to 85 per cent. of the silica brick made in the United States—nearly all from the quartzite found in the Medina and Oneida formation, quarried in Huntingdon and Blair counties. In this restricted area the quartzite is at its best; towards the north and south it becomes softer, is no longer a true quartzite, or is too much impregnated with iron. The rock is easily accessible in the counties mentioned; enormous quantities lying loose on the surface along the Juniata River and its tributaries. In the course of time it has been weathered and broken up into loose rock or "floes," as they are called, which may cover an area of 1000 acres or more. The depth usually varies from 3 or 4 feet to as much as 20 feet. Smaller floes formed in the same way are found along the flanks of the mountains; but they nowhere compare in size with those formed where the measures have been cut transversely.

This rock is sometimes quarried out of the solid measures; but by far the largest quantity used is that taken from the bodies of loose rock, as the latter is not only cheaper to work but is of more uniform quality. The white Medina formation is not composed entirely of quartzite, but is made up principally of sandstone with intermingled strata of quartzite. Thus, where the formation has been broken up, the softer sandstones unsuitable for the manufacture of silica brick have weathered away and disintegrated, leaving the larger part of the floes consisting of quartzite. When sandstone is mixed with the quartzite in the floes it is readily detected by its appearance, as it becomes much more rounded and worn in weathering than the quartzite, which retains its sharp angular edges. The individual pieces in these floes range from fist-size to boulders weighing many tons. Probably 50 per cent. of the rock occurs in pieces weighing more than 500 lbs. The largest floes are found at the gorges of the Juniata River near the towns of Mount Union, Mapleton, Point View, Lewistown, &c.

It is interesting to note that the Oriskany sandstone, extensively used as glass sand, is found in close proximity to the Medina, and that, although exceedingly pure in its composition, its softness renders it unsuitable for high-grade silica brick. It consists of a mass of minute quartz grains, loosely held together, and often so friable that it can easily be worn away by the hands. On the other hand, the Medina quartzite consists of quartz crystals cemented in a mixture of the same composition. The difference in the two types of rock, when ground for the manufacture of brick, is obvious. The harder stone gives splintery, angular fragments; the other, rounded grains. Experience shows that a hard rock like the Medina is required for physically strong silica brick.

An analysis of the Pennsylvania quartzite is as follows:

	Per Cent.
Silica (SiO_2)	97·80
Alumina (Al_2O_3)	0·90
Ferric oxide (Fe_2O_3)	0·85
Lime (CaO)	0·10
Magnesia (MgO)	0·15
Alkalies	0·20

METHOD OF MANUFACTURE.

Grinding.—After the rock, broken to one man size, is received at the brick plant, it is put through a crusher, which reduces it to practically the size of a 1-inch to 2-inch ring. It is then elevated to storage bins, from which it may be fed in weighed quantities to the wet pans for grinding. Into the wet pans, as the grinding proceeds, 2 per cent. of lime, by weight, is introduced as milk of lime, which, when the brick is burned, serves, in combination with the other elements, to give the necessary bond or physical strength. The fineness of the grinding depends upon the nature of the brick to be made. In general one charge, containing material for 200 bricks, will be ground at the rate of approximately four pans per hour for standard 9-inch bricks; while to obtain the fineness requisite for the intricate and difficult shape-work necessary in bye-product coke-oven construction, only two pans per hour may be possible. The rock is exceedingly hard; and a comparatively slight increase in the fineness of grind is accompanied by a seemingly disproportionate lowering of the grinding capacity, and an increased wear upon the pans. The difference in the ground rock lies, not so much in the actual size of either the coarse or fine grains, as in the relative proportion of fine. There can be no question that the general effect of increasing the fineness of grind is to improve the abrasive resistance of the brick, and the requirements for typical coke-oven specifications have worked no hardship upon the manufacturer; for the present-day stand of workmanship oven shapes is such as to "carry its own grind with it," if the expression may be used. To secure the accurate filling out of shapes, and the clean-cut accuracy essential, the grind is actually much finer than is necessary to satisfy the usual specifications as to that feature.

Moulding.—The ground silica material when ready to mould is of about the consistency of damp sand, but, probably because of the extreme angularity of its grains, has less flow as it is manipulated. As a consequence, the moulds must be filled by pounding with heavy plank beaters, and all corners and shapes of irregular outline must be rammed by hand, much as sand moulds are made, but with heavier blows. Unequal ramming, which leaves a variation in the density of the green brick, will give unequal expansion in the kiln. It is by no means uncommon to lose hundreds of a difficult shape through such fire-cracking. To get proper moulding and ramming requires the strictest supervision. The wear on the steel moulds is exceptionaly severe; and they are often decidedly complicated and always expensive, as "loose sides" must be used. The moulded silica has almost no strength, and can be taken from the mould only by allowing the sides to come with it, after which the sides are stripped. After moulding, the shapes are placed on pallets and dried, either on a steam-heated hot floor or on rack cars in some form of tunnel dryer. The bricks are then ready to be set in the kilns.

Burning.—The majority of silica bricks are burned with soft coal in the familiar type of round, down-draught kiln. The following schedule of burning may be considered as fairly normal. When the setting is complete and the doors are sealed, fire is immediately started, and continued slowly with slight acceleration for nine to twelve days, during the last two or three of which the final temperature should be practically attained. The kiln is then held at the required temperature—say, at No. 26 cone (1650° C., or 3002° Fahr.)—directly in front of the firebox, for another day, after which the fireboxes may be sealed, and allowed to remain thus for approximately twenty-four hours more. The cooling requires about as long as the burning.

Effect of Burning on Composition and Expansion.—In discussing the desirable qualities of silica bricks, it is frequently said that "all the expansion shall be burned out of them." This brings out the questions: What is the nature of this expansion; what produces it; what is its extent; and how fully can it be controlled? Let it be premised that all silica bricks are made in moulds smaller than the proposed finished or burned brick; and that under the influence of heat a permanent expansion occurs, swelling the brick from the mould or "green" size to the required or "burned" size. It is desirable that this permanent expansion be completed during burning, so as to preclude further permanent expansion when in use. Expansion will occur on heating—a true thermal temporary expansion that will disappear upon cooling, which must not be confused with the permanent expansion produced in the brick during its manufacture. If a silica brick is not properly burned, then, upon re-heating in actual coke-oven use, there will be not only its normal thermal expansion, but an additional permanent expansion. It is essential in the construction of the coke-ovens that the expansion, whatever its nature, be as small as possible, and that, whatever it is to be, it be known and adequately cared for.

It will be recalled that the silica brick under consideration is formed by adding 2 per cent. of lime to quartzite rock of the following composition:

	Per Cent.
Silica (SiO_2)	97·80
Alumina (Al_2O_3)	0·90
Ferric oxide (Fe_2O_3)	0·85
Lime (CaO)	0·10
Magnesia (MgO)	0·15
Alkalies	0·40

The representative silica brick produced may be assumed to have the following composition:

	Per Cent.
Silica (SiO_2)	96·25
Alumina (Al_2O_3)	0·88
Ferric oxide (Fe_2O_3)	0·79
Lime (CaO)	1·80
Magnesia (MgO)	0·14
Alkalies	0·39

What are the changes which occur as the siliceous mass is

burned? Certain of them are obvious, such as the formation of a bond of one or more of the lime-silica compounds, such as the meta-silicate CaO,SiO_2 or $2CaO,SiO_2$. With the exception of the lime present, the ferric oxide and the alumina, though small in quantity, are the preponderating impurities, and there is undoubtedly formed a certain amount of silicate of iron as well as compounds of the lime-alumina series. Whereas the lowest melting point incident to any eutectic of the lime-silica system is 1436° C. (2617° Fahr.), and of the alumina-silica series 1610° C. (2930° Fahr.), while that of the lima-alumina system is 1400° C. (2552° Fahr.), some of the eutectics of the ternary system, CaO, Al_2O_3, SiO_2, melt at approximately 1170° C. (2138° Fahr.), and are thus among the first of the flux compounds resulting.

No less important, though less recognized, changes occur in the brick as it is heated. The evidence of this change is seen by the most casual measurement when bricks are drawn from the kiln from time to time, as higher temperatures are reached. The final expansion will be very close to $\frac{3}{8}$ inch per foot. The theory of this expansion is that a change occurs in the crystalline form of the silica—an inversion from the quartz crystal to the crystalline form of crystobalite.

ANALYSIS OF COMMERCIAL BENZOLS.

At the Meeting on Monday last week of the London Section of the Society of Chemical Industry, Mr. PERCY E. SPIELMAN described a new method for analyzing commercial benzols.

The author said the name of Mr. Wheeler should have been associated with the paper, the object of which was to describe an easy method of technical valuation—rather than a method to please those dealing in atomic weight—to evaluate the benzene, toluene, paraffin, and carbon bisulphide in a commercial well-washed benzol reaching to about 20 per cent. of toluene. Beyond that, the method would scarcely work. It was assumed (and justifiably so) that commercial benzol consisted primarily of toluene, benzene, paraffin, and carbon bisulphide; the only other constituent being thiophene, which could be ignored as it only made $\frac{1}{2}$ per cent. on the evaluation of the paraffin, while the other substances that were present were really too small to have any effect. The aim had been simplicity; and the method rendered it necessary only to do one distillation and two specific gravities. If the sample was distilled in an ordinary flask up to 90° C., then the quantity which passed over was proportional to the quantity of toluene in the sample. Actually, the quantity that remained in the flask was proportional to it; but by making up an empirical curve, the quantity of toluene could be found in this way. Taking the specific gravity of the sample—after removing the carbon bisulphide, and taking the gravity of the resulting free liquids—the difference between the two gravities was proportional to the quantity of carbon bisulphide. It had already been suggested by other workers that this was so; but he did not know whether it had been used as a direct method of estimation. Knowing the proportions of benzene, it was a simple matter to find the specific gravity of the toluene and the carbon bisulphide. The difference between the specific gravity of the substance after the removal of carbon bisulphide and that of the toluene-benzene mixture was proportional to the amount of paraffin; and that was all it was necessary to do. He and Mr. Wheeler had taken a large number of samples and a large number of known mixtures, and the accuracy had been found to be within 1 per cent.

Dr. HAROLD G. COLMAN said he had tested Mr. Spielman's method and found it gave results within the limits he had mentioned, applied to known mixtures of pure materials and carefully carried out. He congratulated Mr. Spielman on having found a quick method for this purpose.

The CHAIRMAN (Mr. A. R. Ling), in proposing a vote of thanks to the authors of the paper, congratulated them upon their method, which (unlike many analytical methods) had been confirmed by a well-known expert.

A Jacketed Gas-Burner.

A new Teclu gas-burner was (says "Engineering") described by P. Verbeck in the "Chemiker Zeitung" of Dec. 11. It is a bunsen burner, which is provided with two concentric tubes; the air being sucked down through the annular space between the two tubes, and reaching the flame from below in a preheated state. The connection with the rubber tube from the gas-pipe is made, as usual, in the base of the burner; and the orifice of the horizontal gas-inlet tube can be closed more or less by the pointed end of a screw. Into the base is screwed a block, which widens out to a disc. Into this disc and its cylindrical shell the two burner-tubes and other parts are screwed. The block is perforated; and the perforation ends above in the nozzle for the gas-jet. The inner tube and, further out, the outer tube surround this nozzle; and both these tubes are opened-out a little conically at their lower and upper extremities. The air-feed can be adjusted by lowering or raising the outer tube in its screw-fitting. The arrangement is less complicated than it might appear, as all the parts can easily be fitted together. The advantage claimed is that a short, stout flame can be produced, which completely envelops the crucible to be heated; but when a long, narrow flame is desired, a short, straight cylindrical tube is lowered into the inner tube, on the edge of which it rests.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Pitch Problem.

SIR,—To find a use for pitch seems to be apparently a difficulty—and to carbonize it in high-temperature retorts is simply to waste the valuable oils it contains—to say nothing of the good coke it will yield if properly carbonized. Pitch contains from 50 to 54 per cent. of volatile matter, and 28 to 32 per cent. of fixed carbon.

By low-temperature carbonization, approximately $\frac{3}{4}$ gallon of crude (water-free) oils can be obtained per 1 per cent. of volatile in the pitch. These crude oils will fractionate into benzols, phenols, &c., &c.

The trouble which presents itself is the low melting point, which makes it difficult to retort and carbonize; but if any one interested will send 3 tons of pitch to the low-temperature carbonizing works at Battersea which I control, I do not doubt that it can be carbonized economically, and with excellent commercial results.

F. D. MARSHALL.

19, *Queen Anne's Chambers, Westminster, S.W., March* 11, 1916.

Dyes and High Explosives.

SIR,—Your article, "Dyes and High Explosives—After the War," provides food for thought. In the present international upheaval, the hundred-and-one confronting difficulties of the hour naturally demand additional care; but now one has become reconciled to troublesome matters in gas management.

The principal effort, however, of a gas undertaking is directed to the production and sale of gas at the lowest possible figure, both for public benefit and the security of invested capital. The war, as you point out, offers an opportunity of constructive policy; and one would ask how are such opportunities to be used to the best advantage, and have we done as much in the past as could have been accomplished (say) by better co-operation?

The topic of tar will serve to illustrate the question. Is this commodity only something to be drawn off from the gas-works with the minimum of trouble, and thus cease its connection with gas manufacture, or should a valuable product be worked-up by the industry, and dealt with commercially? A recent movement in the House on this very matter might be accepted as an invitation to commercial application. Tar to coal in ratio being six-and-a-quarter per cent., its parts as we know them under the sliding-scale are:

	Concomitan Part of Tar. Per Cent.		Ratio to Coal. Per Cent.
Pitch	63·22	..	3·95
Crude naphtha	3·24	..	0·20
Carbolic	0·96	..	0·06
Creosote	32·08	..	2·00
Anthracene	0·50	..	0·04
	100·00		6·25

Evidently pitch can be carbonized with good result up to 5 per cent. of coal. That would apparently leave a 20 per cent. margin over and above a possible total carbonization. Creosote has calorific properties which might be turned to remunerative account. Only 0·3 per cent. of the total weight of coal remains. The sooner a new tar policy is considered, the better will it be for the gas consumer and proprietor, as well as the advocates of a purer atmosphere.

The call of to-morrow is co-operation—co-operation between the accountant, the chemist, and the engineer, with a representative Association for all matters concerning the industry's important work.

March 11, 1916. OIKONOMIA.

The Naphthalene Plant at Bury.

SIR,—I have read with interest the paper on "Naphthalene" that Mr. Simmonds, of Bury, put before the Manchester District Institution of Gas Engineers at their meeting on the 26th ult., and am pleased to notice that he has experienced considerable benefit by spraying naphtha into the gas. I have no doubt that had he not been using the process at the same time that he was washing the gas with tar for the extraction of toluol, &c., he would have had a very bad year for naphthalene stoppages.

I think, however, Mr. Simmonds, in justice to myself, should have mentioned that the apparatus he described in his paper is an exact copy of one he inspected at our Grimesthorpe Gas-Works. On June 27, 1913, Mr. Simmonds wrote asking for a sketch and particulars of my spraying apparatus, to which I replied: "Come over and see it for yourself." He did so on July 2, 1913, and I then gave him all details, showed him the results we had obtained, and the material we were using.

I may say that I designed the apparatus and have had it continuously at work with considerable success since 1905. JNO. W. MORRISON.

Sheffield, March 6, 1916.

Pitch Carbonization.

SIR,—If it were not for loss in memories, there would be great conflict even among ourselves—the present with the past; and people might say, "Here is an industry of great profession, which, after 116 years, has not made up its mind what it is best to do with tar."

We have tried burning tar body and soul for heating retorts. By an accumulation of science, tar is now dissected limb from limb, sinews from veins, tissue from flesh, until (so to speak) there is only left the mummy—pitch.

War has forced us into the exhumation of a "dead horse" in the vainest hope of flogging life into it again, and so many of us remember

how, in its vigour of life, it kicked us most severely when it stabled itself in the hydraulic main—its pet stable.

It would be passing an opportunity not to give the benefit of a recent search through the "JOURNAL" anent tar, pitch, and naphthalene.

Following the discussion of "Tar Firing under Retorts" brings us to Jan. 12, 1904, p. 80, when we find an article "The Coming of the Vertical Retort: the Settle-Padfield Vertical Retorts at Exeter." The numerous tests included therein gave "No tar." On March 22, 1904, as the outcome of the Exeter results, Mr. George Helps wrote under the title "Is Tar a Necessity?"

It is interesting and opportune to reproduce the figures of a test made by the late and much lamented Professor Lewes.

Coal Used in Settle-Padfield Verticals—Camerton Slack.

Gas	13,250 cubic feet per ton.
Illuminating power .	14 75 candles ("London" Argand No. 1).
Heating value . . .	533·7 B.T.U.
Tar	None.

Same Coal in Horizontal Retorts.

Make per ton—	
Gas	9862 cubic feet.
Illuminating power .	15 candles.
Tar	10 gallons.

It should be remembered that the Settle-Padfield process only yielded 4 to 6 gallons of tar, which was returned to the retorts in very minute quantities, and in this way was entirely disposed of.

An average of the composition of the gas from tests made by Professor Lewes gave 61·23 per cent. of hydrocarbon content due, he said, "to the large ratio of heating surface to the mass of coal, to getting the best out of the tar vapour, and to the gases not coming in contact with any surface to decompose them."

Having completed the search for all that can be found for and against tar and pitch, the history of naphthalene is so voluminous that one can only draw attention to the various articles—such as that in Jan. 3, 1905, p. 28, "Making Gas Entirely Free from Naphthalene." It is notable that in the many tests of gas from the Exeter verticals there appeared—"Naphthalene, Slight trace," "Naphthalene, None," and with the present systems of verticals, there is still no naphthalene present. Therefore it would appear that gas made in the vertical retorts sent through the mains is worth a whole army of gas fitters outside, with absolutely no need whatever for atomizers, spray solvents, and like remedies, which brings us to the bed-rock, that "Prevention is better than cure."

L. S. T.

March 11, 1916.

Price of Gas at Felixstowe.

SIR,—I notice in your report of our annual meeting you state that "the net cost of the gas sold in 1915 was 3d. per 1000 cubic feet more than in 1914; and seeing that they [the Company] only got 3d. increase, and this on a considerably less output, it was obvious they could not expect to show anything like the profit they usually had." I should point out that the increase in the net cost of the gas sold was 5d. (not 3d.) per 1000 cubic feet, and that the 3d. increase in price was on the last six months of the year only, which the words "and seeing that they only got 3d. increase, and this on a considerably less output" does not seem to make it quite clear.

F. M. PATERNOSTER.

Felixstowe, March 8, 1916.

Mortgage Bonds.

SIR,—I am pleased to be able to give a satisfactory reply to the letter of "Enquirer."

In 1902, the same idea occurred to me, and I communicated with Somerset House. They replied as follows:

> "I am directed by the Board of Inland Revenue to acquaint you that an endorsement under hand for extending or varying a marketable security, such as that in question, is held to be chargeable with the duty of 6d. only, provided that it is executed during the currency of the security."

Of course, I have since acted accordingly.

ACCOUNTANT.

March 9, 1916.

Showroom Reform.

SIR,—May I again trespass on your columns, in reply to the letter from a "Northern Showroom Manager" which appeared in your last issue. In doing so, I would remind your correspondent, firstly, that there are questions involved on all sides in a controversy of this kind.

Apparently fortune has smiled upon him, inasmuch as he has obtained recognition for his abilities. In this respect one must allow he should speak for himself. But, evidently, he is quite in ignorance of how showroom men are treated in another part of the country, which above all should lead in these matters. Our case is that initiative and efficiency are not adequately recognized.

Platitudes uttered by men holding high positions are all very well; but if they are not backed up by action, of what use are they? One cannot live upon them; neither do they encourage one.

He says [referring to Mr. Cyril Davis]: "If we attain to the all-round efficiency which these articles advocate and so ably describe, we shall be able to command a position of dignity and authority, with its accompanying increase of salary." I am sure we are much obliged for the information, and we respectfully commend it to all gas undertakings; for one has there the whole case in a nutshell.

As to the suggestion of an Association, it would be gladly welcomed, provided loyalty to the undertaking would not be impaired.

In conclusion, I take this opportunity as a last word of expressing an earnest hope that, having been able, through the courtesy of the "JOURNAL" to ventilate our views, our claims will receive the kind considerations of the heads of gas undertakings, to the mutual benefit of all concerned.

FAIRPLAY.

March 9, 1916.

[This correspondence may now be considered as closed.—ED. J.G.L.]

REGISTER OF PATENTS.

Delivering and Compressing Gases.

WEGMANN, E., of Wülflingen, Switzerland.

No. 210; Jan. 6, 1915. Convention date, Jan. 6, 1914.

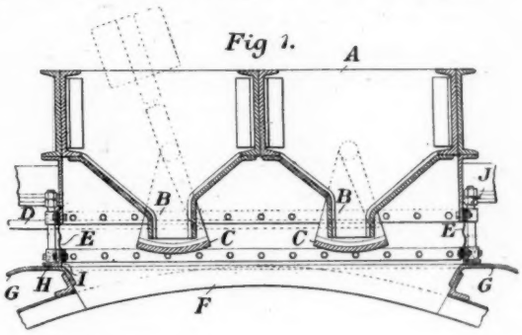
This invention relates to apparatus for delivering and compressing gas by means of a liquid issuing in the form of a jet from a nozzle. To increase the efficiency of such apparatus, a blade wheel is sometimes arranged in front of the nozzle—the wheel being rotated by the issuing jet of liquid, changing the shape and direction of motion of the issuing jet. But according to the present invention, the vane-wheel driven by the issuing jet of liquid is coupled to a fan, which sucks the gas to be delivered, and forces it into the jet of liquid issuing from the vane wheel—an arrangement which is said to produce "increased efficiency, together with a simplification in the construction."

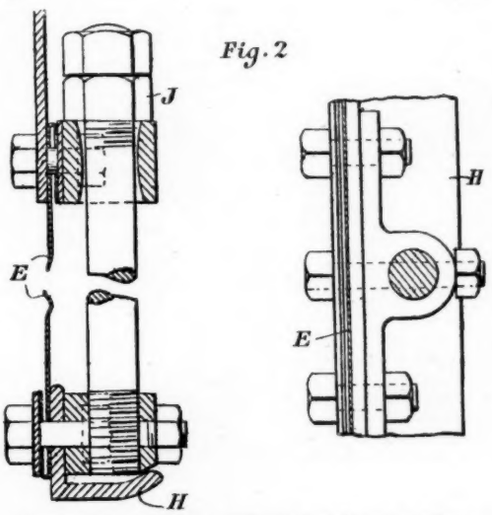
Preventing Escape of Coal Dust during the Discharge of Retorts, &c.

WARNER, A. W., and the RITER-CONLEY MANUFACTURING COMPANY, Allegheny, Pennsylvania, U.S.A.

No. 2693; Feb. 15, 1915.

The present invention is "particularly applicable for use in connection with charging apparatus employed in a gas retort house"—for example, as shown in Patent No. 17,855 of 1912; and in the illustration accompanying the specification there is shown a stationary bin and the upper portion of a coal-hopper on a charging machine designed to travel in front of the retorts and under a stationary storage bin.





Warner's (Riter-Conley Company) Coal-Charging Hopper.

Fig. 1 is a vertical sectional view of a portion of a coal-bin and a portion of the upper end of a coal-hopper designed to be carried on the charging apparatus. Fig. 2 is an enlarged side elevation and part horizontal section, particularly showing a guide-rod and adjusting nuts.

A is a stationary bin having a sloping bottom and coal discharging openings B, controlled by doors or gates C operatively connected with a rod D, moved to open the door by any suitable means (not shown). The stationary bin is provided with depending members which, when assembled and secured to the bin, constitute a rigid rectangular frame. Secured to its lower edges are strips E of suitable flexible material (as strong canvas) the upper edges of which are held between the downwardly depending members and bars secured to the frame by bolts. There is thus constituted "simple and efficient closure means adapted to co-operate with the receptacle into which the material contained in the bin is to be introduced."

F is the hopper receiving coal from the discharge opening of the stationary bin, and designed to be carried on the upper portion of a charging apparatus (not shown). The hopper, or the opening through which the material is introduced to the hopper, is rectangular, and bounded by a mouthpiece G, designed to make contact with the closure

means or its lower metallic frame as the charging apparatus carrying the hopper is moved under the bin.

The flanged portions and the mouthpiece are formed so as to provide for an automatic raising of the frame I by the positioning of the hopper below the discharge openings—nuts being adjusted to cause the frame to have its lower position at a point where the co-acting faces of the flanged portions provide a proper meeting without damaging either the frame or hopper. When the hopper passes out of engagement with the frame, the latter returns to its lower position—the nuts J acting to limit the length of such return movement.

By the construction described, the patentees claim to have provided "simple and efficient means for preventing the escape of dust, &c., into the building in which the apparatus is located during the operation of transferring the coal from the stationary bin to the movable hopper.

Gas-Burner Chimney.

RASCH, L., of South Norwood, and WATKINSON, F., of Farringdon Road, E.C.

No. 3267; March 1, 1915.

A chimney made in accordance with this invention is provided with a hole (for the purpose of inserting a match, taper, or other lighter) above the mantle, or, in cases where no mantle is employed, the hole is placed just above the burner.

The patentees say they have found that, "by employing a single hole, large enough to receive a lighter, the burner can be lighted without explosions, and with much less risk of damaging the chimney or mantle where employed than is the case with other chimneys;" also, with a chimney of this description, the "combustion is improved."

Controlling the Supply of Gas to Geysers.

FRANKLIN, W. J., of Queen Victoria Street, E.C.

No. 3430; March 3, 1915.

This invention is described (by way of example) in connection with its application to geysers and like apparatus—for controlling the supply of gas and water to them. For this purpose arrangements are provided wherein the gas and water valves are so interconnected that while it is impossible to turn on the gas and light the burner without first partially opening the water-valve, the latter can be subsequently operated to regulate the water flow between certain limits without affecting the gas supply—the final act of turning off the water simultaneously turning off the gas. Interconnection between the valves is effected by means that at one time cause both valves to be operated simultaneously and at another time permit the water-valve to be operated alone, or else to always produce a simultaneous operation of both valves without the gas supply (when once fully turned on) being further affected.

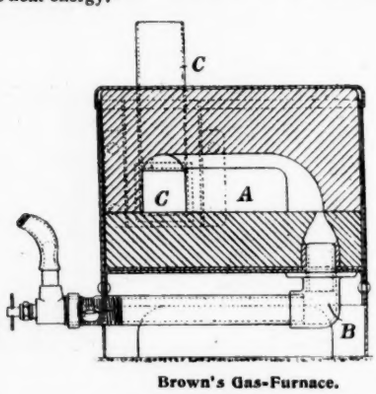
For example, where the gas supply is controlled by a plug cock and the water by a screw-down valve, the latter may be arranged so that its axis is parallel with the axis of the plug and the valve stem and plug be provided with toothed segments (conveniently, quadrants) so arranged that they will be caused to mesh while both valves are closed. By appropriate angular disposition of these segments, it can be ensured that the water-valve shall be opened to a slight extent before the plug is turned sufficiently to permit gas to pass to the burner—both valves opening thereafter in unison until the plug cock is fully open. Then, by reason of the axial displacement of the quadrant upon the stem of the screw-down valve, the latter becomes disengaged from the plug quadrant. But, thereafter, the screw-down valve can be further opened to regulate the water supply without affecting the plug cock and gas supply. Conversely, when the screw-down valve is sufficiently closed, the quadrants will again become engaged, and the gas-valve is caused to close before the water supply is finally arrested.

Gas-Furnaces.

BROWN, D. A., of Glasgow.

No. 16,905; Dec. 1, 1915.

This invention relates to furnaces suitable for heating soldering irons and other articles of the type in which the walls only are impinged on by the flame, so that the article is isolated from any influence tending to effect oxidation, while the walls are designed for "thermal storage of the heat energy."



Brown's Gas-Furnace.

As shown, the furnace comprises the usual jacket of refractory material enclosing a pocket A for the reception of (say) the soldering iron. The pocket is dished above, as shown, so as to provide a path for the hot products of combustion and prevent their contact with the article being heated. It is provided with a restricted opening to permit the entrance and withdrawal of the article to be heated. Fitted in the refractory base supporting the jacket is a gas-burner B, the nozzle of which is so arranged that the flame impinges on the inner surface of the jacket without approaching the article to be heated. The jacket is formed with a lateral outlet C for the products of combustion.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 8.]

Nos. 2918—3306.

BRADLEY, A.—"Manufacture of trinitrotoluol." No. 3056.
KEITH, G. & J.—"Controlling the mixture supplied to gas-fired furnaces." No. 3181.
KHAN, A.—"Shades or screens for lamps." No. 3043.
ROLLASON, A.—"Increasing heating power of coke." No. 3196.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:

Bills read a second time and committed: Aberdare and Aberaman Gas, Colchester Gas, Ferndale Gas, Hornsey Gas, Imperial Continental Gas, Newcastle-upon-Tyne and Gateshead Gas, Yeadon Water.

HOUSE OF COMMONS.

The following further progress has been made with Bills:

Bill read a second time: Aberdeen Corporation Water.
The Wakefield Corporation Bill has been referred to the Committee on Unopposed Bills.

Gas Orders Confirmation Bill.

A Bill to confirm certain Provisional Orders made by the Board of Trade under the Gas and Water Works Facilities Act, 1870, relating to Fleetwood Gas and Long Eaton Gas, was presented by Mr. Pretyman last Wednesday, read the first time, and referred to the Examiners of Petitions for Private Bills.

Technical Instruction.

This subject was raised in the House last Wednesday by Sir Philip Magnus, who asked the President of the Board of Education whether, in deciding the amounts of grants to be allocated for technical instruction, he would consider the urgent importance at the present time of maintaining the standard of efficiency of teaching in technical schools.

Mr. H. LEWIS replied that the Board were strongly convinced of the importance of maintaining the standard of technical instruction under war conditions, and developing that instruction to the highest possible point as soon as the pressure of external circumstances was reduced.

Daylight Saving Bill and National Economy.

Replying to questions asked in regard to the appointment of a Committee to inquire and report as to whether the proposals of the Daylight Saving Bill if put into operation would result in substantial national economy, the Prime Minister said he did not think there was sufficient reason to appoint a Committee of Inquiry on this subject.

Coal Prices.

Mr. BARNES asked the President of the Board of Trade if he was aware that some owners in Scotland were rendering useless the provisions of the Price of Coal (Limitation) Act, 1915, by making it a condition precedent to coal merchants obtaining supplies of coal that they must contract to pay the existing high prices of coal during the next six months (and in some cases the next ten months) with the alternative that in the event of their refusal to contract no supplies of coal would be given; if he had received letters from coal merchants in Glasgow stating that coal had been offered for sale on the conditions mentioned; and, if so, if he had considered these letters, and did he regard the offers so made as a contravention of the Price of Coal (Limitation) Act, 1915; and, if so, what steps did he propose to take in the matter?

Mr. RUNCIMAN said he had received representations on the subject. Where there were no contracts two years ago with which comparison could be made, the determination of the proper price for new contracts presented some difficulties. The whole question was bound up with that of securing supplies, and the best course would be for representatives of the merchants to discuss it with the District Coal and Coke Supplies Committee for Scotland in the first instance.

Mr. BARNES asked whether Mr. Runciman was aware that they declined to do that, and did he know that the Lanarkshire coalowners were stipulating that contracts should be made now instead of at the end of June, and that a letter had been sent to his Department asking for advice on this matter and no reply had yet been received?

Mr. RUNCIMAN: I am not aware that they have consulted the District Coal and Coke Supplies Committee for Scotland. My information is that they have not yet done so. If they had done so in the first instance, we should most probably have arrived more rapidly at a solution of the difficulty.

The minutes of the Manchester Corporation Gas Committee show that, at a recent meeting of the Bradford Road Gas-Works Station Sub-Committee, a tender was accepted for the erection of a power-house for electrical plant at the works.

LEGAL INTELLIGENCE.

PROCEDURE IN A CONSPIRACY ACTION.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Monday, March 6.

(*Before Lords Justices* SWINFEN EADY *and* BANKES.)

Lamb and Wife v. Walton-on-Thames and Weybridge Gas Company and Others.

This appeal was in connection with an action for conspiracy arising out of a prosecution at the Central Criminal Court, a report of which appeared in the issues of the "JOURNAL" for July 27 and Aug. 3 last.

Mr. COMYNS CARR said it was an appeal by the plaintiffs from the order of Mr. Justice Coleridge, made in an action brought to recover damages for alleged conspiracy; and the appeal raised the point as to particulars proper to be ordered in such an action. Lamb was for many years the Secretary of the Walton-on-Thames and Weybridge Gas Company; and a man named Ross was a collector in the employ of the Company. Both were insured by the Guarantee Society—Lamb for a large sum, and Ross for a small amount. It appeared that Ross committed serious defalcations; and Lamb was charged with being implicated in the matter. The Gas Company made claims in respect of each of the guarantee policies; and it was pleaded that the defendants had conspired among themselves that, as a condition of allowing the claim under the policy, the Gas Company should assist the Guarantee Society in obtaining the sum of £500 by wrongfully threatening Lamb that, if he did not hand over this sum, the Gas Company would institute a prosecution for felony, and by wrongfully and falsely representing that, if he did pay the sum and hand over certain securities, the prosecution would not be instituted. It was alleged the Guarantee Society made both the threat and the representation, and obtained from Lamb £193 in money and two policies of life insurance. After the money had been paid, the Gas Company, in spite of the representations made, maliciously prosecuted the plaintiff, who, at the trial, was acquitted. On these pleadings, Master Day had ordered particulars to be given of the conspiracy alleged, giving acts and communications, oral and in writing, of all or any of the defendants, with dates and places of such acts and communications, and, if in writing, identifying the documents. Lamb did not object to give particulars as to the object of the conspiracy, or any overt act done; but the order went beyond this, as it referred to the formation of the conspiracy. He submitted, first, that, on principle, the order ought not to be made at all; and, secondly, that the form of the order was far too stringent. At the trial at the Central Criminal Court, letters were put in; and by obtaining, at some expense, the shorthand notes of the trial, the plaintiffs might dig out some things which would satisfy the order. But it would be oppressive, at the present stage of the case, that the plaintiffs should be put to the expense of giving particulars of things which the defendants were well aware of. It was very unlikely, in a conspiracy action, that the plaintiffs would know how the defendants had conspired. If any order were to be made, he suggested it should be that if the plaintiffs' proposed to rely on any evidence as to specific acts, other than those specifically alleged in the statement of claim, particulars should be given 21 days before the trial; and, in default of so doing, plaintiffs should be precluded from relying on such evidence-in-chief—provided the order did not preclude the plaintiffs from cross-examining the defendants' witnesses for the purpose of proving the allegations.

Mr. W. H. MORESBY (for the Gas Company), in support of the order appealed against, contended that the plaintiffs should be ordered to give particulars, as a definite agreement was relied upon. During the criminal trial, it was suggested that Mrs. Lamb, while listening at the keyhole of the Board-room of the Gas Company, overheard a certain conversation; and he had a very shrewd suspicion that this conversation was to be relied upon in support of the charge of conspiracy.

Mr. M'CARDIE (for the Guarantee Society) submitted that a plaintiff ought not to be allowed to start such an action without giving particulars showing a *bonâ fide* cause of conspiracy.

Lord Justice SWINFEN EADY said there was no ground for saying that the plaintiffs ought not to give particulars with regard to acts as to the formation of the conspiracy, by writings or communications which it was intended to rely upon at the trial. It might be that in the possession of the defendants there were copies of letters upon which the plaintiffs might seek to rely; and if it would assist in establishing the conspiracy, plaintiff ought to have discovery in order to enable him to include the letters in the particulars. Therefore the order for delivery of particulars should be after discovery. The order of the Court below would be varied, and would be that, if the plaintiffs "propose to rely on any specific fact or facts, and on any communication, oral or in writing, other than those specifically alleged, the plaintiffs should within 14 days after discovery deliver to the defendants particulars of such acts, &c., in writing; and, in default of such particulars, should be precluded from relying on them, unless the Judge at the trial should be of opinion that the defendants were under no disadvantage, from not having the particulars." This order would not preclude the plaintiffs from cross-examining the defendants' witnesses for the purpose of proving the allegation. The costs of all parties to the appeal, and in the Court below, would be costs in the action.

The Salford Gas-Works as a Controlled Establishment.—The General Purposes Committee of the Salford Corporation have passed a resolution approving one agreed to earlier by the Gas Committee directing application to be made to the Ministry of Munitions to declare the Corporation gas-works a controlled establishment, under the provisions of section 4 of the Munitions of War Act, 1915, in addition to section 7 of the Act.

MISCELLANEOUS NEWS.

TRIBUNALS AND EXEMPTION APPLICATIONS.

Before the Military Service Act Tribunal at Glasgow, an employee of the Corporation, who appealed, stated that he had a badge and certificate from the Ministry of Munitions. He was employed as chief clerk and meter inspector in the Gas Department. Mr. P. G. Stewart: Could a woman not do the work? We have a lot of women doing work as meter inspectors in Glasgow; and they are doing it very well. The Military Officer said he did not understand how the badge and certificate were granted. They wished to know how the Minister of Munitions granted it. The Applicant: My employers applied for it, I understand. The Military Officer said that workers inside the gas-works were badged; but this man should not have got a certificate. It was agreed to adjourn the appeal for inquiry.

On behalf of the Bury St. Edmunds Gas Company, exemption was sought for two men—one of them a stoker. It was stated that there had been 26 men on the staff; but 11 had left. Total exemption was granted to the applicants so long as they continue in their present employment.

Before the Crook Tribunal, an application was made for the exemption of a plumber in the employment of the Weardale and Consett Water Company. It was stated that the Company had already released nine plumbers, and work generally was behind. If the application failed, and the man was taken, the water supply in the area would be imperilled. The Military Representative said they sympathized with the application; but the need of men for the army was urgent. The application was refused.

The Darlington Military Tribunal last Wednesday granted exemptions for two months in the cases of a couple of clerks in the office of the Weardale and Consett Water Company. The Mayor (Alderman J. G. Harbottle) suggested that the Company should arrange to find women substitutes, which, he said, had been done in many cases by the Darlington Corporation.

Before the local Tribunal, the Stone Gas Company applied for exemption for one of their workmen, on the ground that he performed work in the yard, and it was a certified trade. This was not allowed.

Before the Worthing Tribunal, a firm of contractors applied for exemption of a carter employed in carting coal from the railway station to the gas-works. The military objected, on the ground that if the occupation was a certified one, it was not necessary in the public interest that the man should continue in it. The attention of the Tribunal was directed to the fact that the question to be decided was whether the man was a carman at a coal depôt or wharf in connection with the transport trade. The employer said his firm carted nearly 18,000 tons of coal a year from the railway to the gas-works; and he was also carting toluol from the gas-works for the Government. The contract was with the Gas Company. The Tribunal decided that the occupation was a certified one, and that the applicant came within it.

A conscientious objector who appeared before the Sedgefield Tribunal last Friday said he had given up his employment at a bye-product works because he felt that he was assisting indirectly to take life. They made benzol, then toluol, from which was got picric acid – the basis, he said, of all high explosives. The application was rejected.

Before the Southwark Tribunal last Saturday, Messrs. J. & J. Braddock, gas-meter manufacturers, of 45, Westminster Bridge Road, applied for the absolute exemption of two of their employees who were described as "managers of gas-meters, &c." In a letter they pointed out that the men were absolutely essential to their business, as they were fixing meters in the military huts erected for the soldiers. They were also making drums for explosives. The men were found to be in "certified occupations," and were exempt from service.

Application for exemption was made before the Salisbury City Tribunal on behalf of an assistant manager of the distribution department of the Salisbury Gas Company, for whom Mr. G. Fullford, the Chairman of the Directors, appeared. He said the Company had looked upon themselves as a recruiting department. Of their men, 33 per cent. were with the Colours, and a few weeks ago they gave notice to those employees who had not attested. In the Manager they had an enthusiastic recruiter. They asked for the retention of the services of the applicant on account of his technical knowledge. The military report expressed agreement with conditional exemption so long as the applicant remained in his present employment and the conditions remained the same.

TYNEMOUTH GAS COMPANY.

The Fiftieth Annual Meeting of the Company was held on Monday of last week—Mr. J. B. WILLIAMSON, J.P. (the Chairman), presiding.

The CHAIRMAN, in moving the adoption of the report and accounts, said that, generally speaking, and after taking into account the abnormal conditions which prevailed during the past year in consequence of the war, the results shown in the balance-sheet must be considered good. After meeting all charges, including interest on debentures and loan account, the net profit was sufficient to pay the statutory dividend of 5 per cent. for the year, and allow the addition of about £300 to the balance of £4914 brought from last year. This left a balance to carry forward of £5214. The revenue from gas was £62,250, against £60,999 in the previous year, an increase of £1251. The increase would have been larger had not the restricted lighting, both public and private, been necessary. The quantity of gas manufactured during the year had been 578,580,000 cubic feet, against 580,352,000 cubic feet in 1914, a decrease of only 1,750,000 cubic feet. This was very satisfactory, and was explained by the fact that, whereas gas for lighting purposes had been seriously reduced, the loss had been compensated for by the increased quantity used in furnaces, in munition factories, and by the increased use of gas for cookers, fires, and other heating apparatus. The price paid for coal during the year had been quite reasonable; and

the shareholders would be pleased to know that a favourable contract for all the requirements over the current year had been made. The quantity of coal carbonized was 48,200 tons, against 49,674 tons in the preceding year, a decrease of 1474 tons. The reduction was partly accounted for by the better results obtained in the retort-house, where the gas produced from each ton of coal used had been a record. Residuals had given fairly good results; and on the year's work they were better by £1513. Turning to the expenditure, it would be noticed that coal had cost £1043 less than in the previous year. This was caused by more gas being produced per ton of coal, as already mentioned. Maintenance of works, including repairs and renewals, was very much up. Last year this item was £7579; this year it stood at £10,084. The increase was caused by the higher wages and the war bonus paid to the men, and also to the very great increase in the cost of materials, including renewals of retorts, machinery, &c. This was a department in which it was very difficult to save, as the plant and works must be kept in the highest state of efficiency. The price of goods and materials used in repairs and renewals had advanced 10 to 70 per cent. above pre-war prices. Owing to the war, no extensions or special work had been possible. The Company had lost by death Mr. William Oxley, who had been a Director for eighteen years; and their oldest servant, Mr. Harrison, the Chief Accountant.

After the report had been adopted, the usual dividends were declared, on the ordinary stock at the rate of 5 per cent. per annum, and on the preference stock at 4 per cent. per annum—both less income-tax.

HARROW AND STANMORE GAS COMPANY.

Good Progress in Sales During War Time—A Promising District.

The Ordinary Half-Yearly Meeting of the Company was held yesterday week, at the Westminster Palace Hotel, Victoria Street, S.W.—Mr. ARTHUR F. PHILLIPS in the chair.

The ENGINEER and SECRETARY (Mr. J. L. Chapman) read the notice calling the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN said the proprietors had reason to congratulate themselves on the results of the half year. The capital account showed an expenditure of only £33 on plant, but £637 on new mains, £836 on meters, and £1331 on stoves—together £2838. There was a deduction of £2988 for depreciation of meters, stoves, gasholders, and prepayment services, which reduced the capital expenditure on the termination of the half year by £149, although there was an increase in the gas sold of 7,692,000 cubic feet. The capital expenditure, which the Directors were ever seeking to reduce, was now 15s. 2d. per 1000 cubic feet of gas sold. The Company were fortunate in receiving some of the coal used on favourable contracts made before the war started. While 72 tons more were carbonized, the cost was only £1045 more, or rather less than 2s. 6d. per ton. During the current half year, the full effect of the additional price would have to be borne. The coke used for the manufacture of carburetted water gas showed an increase of £354, because of its enhanced value. The charge for repairs and renewals of mains and services was £3665, against £1761 the previous year—the increase being due to the number of fires and gas-heated water-circulators that had been fixed, and the increased amount written-off for depreciation. The total of the charges under repairs and depreciation of works, mains, services, meters, and fittings and stoves was £10,561, or rather over 1s. 3d. per 1000 cubic feet of gas sold, which indicated that the revenue bore a proper proportion of the expense. The other charges in revenue remained much the same. There were, however, two new amounts—war allowances to employees £286, and war service payments £218, which represented the payments made to dependants of those who had joined the Forces, and amounts reserved for single men, to be given them when they returned at the conclusion of the war. The total expenditure for the half year was £29,874, against £24,170 the previous year. The gas-rental was £27,498, against £24,976 the previous half year—an increase of £2522. Of this increase, £1124 was due to the increase in the sale of gas (which was 4·80 per cent.), and £1397 was from the 2d. increase in the price. The stove and meter rental showed an increase of £301. The receipts for products had gone up from £4411 to £6509—an increase of £2098, due to the higher prices received for coke and sulphate of ammonia. The balance from the revenue account carried to profit and loss was £8017, against £7813 in the corresponding half year. Considering the difficulties there had been to contend with, and that the price of gas was increased only 2d. per 1000 cubic feet, these results might be considered satisfactory. The total quantity of gas sold was 167 million cubic feet. There was an increase in the private consumption of 10,642,000 cubic feet; but a falling-off in public lighting of 2,950,000 cubic feet. After providing £1080 interest on debentures, £7 interest on loans, and £21 for the Red Cross Society, there remained a disposable balance of £12,225. The dividend recommended would absorb £6772, leaving £5452 to be carried forward to next year's account. The works and plant had been maintained in an efficient state. The whole of the Company's employees had carried out their duties satisfactorily. Adequate allowances were made to the dependants of those who had joined the Army. A war bonus was allowed to those continuing in the Company's employ; and a reserve for the single men when they returned. The district supplied by the Company was a most promising one for the future—an immediate suburb of London, intersected with many railways, the development was assured. He moved the adoption of the report and statement of accounts.

Mr. ARTHUR M. PADDON seconded the motion, which was unanimously carried.

Moved by the CHAIRMAN, and seconded by Mr. PADDON, dividends at the rates of 5½ per cent. per annum were declared on the 5 per cent. ordinary stock and 5 per cent. on the preference stock, both less income-tax.

Proposed by the CHAIRMAN, and seconded by Mr. L. ANDREWS, Mr. Paddon was re-elected to his seat at the Board; and, on the motion of Mr. F. R. SMITH, seconded by Mr. ANDREWS, the retiring Auditor Major Charles E. Goddard, M.D) was re-appointed.

The CHAIRMAN, in moving a vote of thanks to the staff and the employees, remarked that both Mr. Chapman and the Superintendent of the works (Mr. Chambers) had had an anxious time. But they had worked well, as had all the staff, in the interests of the Company. The carbonizing had been especially satisfactory, as would be appreciated when he said that the production of gas per ton of coal had been no less than 13,500 cubic feet.

Mr. E. L. BURTON seconded the motion, which was agreed to.

Mr. CHAPMAN, in his reply, said that fortunately the Company had not experienced the great troubles that many others had had; and they were thankful that things had gone along so well for them.

On the proposition of Mr. ANDREWS, seconded by Mr. W. RICHARDS, a cordial vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, acknowledging the vote on behalf of his colleagues and himself, remarked that the administration of gas undertakings just now caused considerable anxiety. There was the difficulty of getting coal and other materials, and that of carrying on business with so many of the employees in the Army. He was afraid these difficulties were more likely to increase than diminish. He was afraid that people generally—more especially in London—failed to realize the serious position this country was in; and he would like to see a strong determination on the part of everyone to do everything in his power to bring the war to a conclusion. He deplored the extravagance that was witnessed, while people should be helping the country by saving their money. He should also like to see more determination on the part of the men employed in munition works and in collieries to give more of their time to assist the country; as well as an entire absence on the part of everyone to make a good thing out of the war.

HORNSEY GAS COMPANY.

A Sound Position under Adverse Conditions.

The Half-Yearly Ordinary General Meeting of the Company was held on Friday, at No. 5, Great Winchester Street, E.C.—Mr. A. M. PADDON, the Chairman, presiding.

The SECRETARY (Mr. W. E. Roberts) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN, on rising, made sympathetic allusion to the death of the late Chairman, Sir Hugh Owen, G.C.B., and spoke of the great services rendered by him to the Company. He added that, in securing so prominent an engineer as Mr. Frank H. Jones to fill the vacancy on the Board, the Directors had acted in the very best interests of the proprietors. Turning to the report, the Chairman said this set forth that there had been a falling-off in the business of the Company, the reasons for which were patent to all. Theirs was a residential district, and one largely occupied by persons of no great affluence; and areas of this kind were affected by the adverse influences of the war to a greater extent than others. Though the accounts were satisfactory, it was pertinent to point out that the full weight of these adverse circumstances had not yet come upon the Company. Looking at the accounts themselves, it would be seen that since 1902, when they obtained important capital powers from Parliament, they had availed themselves but little of these powers. Only about £40,000 had been spent, out of the £160,000 authorized; and of the loan capital there was still £34,000, out of the £40,000, to be issued. The total capital received amounted to £251,563, while £256,406 had been expended; so that they were overspent to the extent of £4843. The figure he had mentioned worked out to £470 per million cubic feet of gas sold per annum. This was a very low figure indeed, considering the size of the undertaking; and it had only been attained by great care and economy in the past. The capital per million possessed a significance which was not always attributed to it; for it determined what share the consumer obtained in the reductions in the price of gas, under the operation of the sliding-scale. In their own case, he thought the consumer received about five-sixths of the benefit. In the six months now under review, £675 had been spent on capital account; but £835 had been written-off for depreciation. In the revenue account, coal, oil, &c., had cost £23 less than a year ago; and they might congratulate themselves on this, were it not for the fact that the decrease in business was accountable for it. There had been spent on repairs and maintenance of works and plant, nearly 5d. per 1000 cubic feet of gas; on mains and service pipes, 1·37d.; on meters, 1·64d.; and on stoves and fittings, 4½d. within a little. These were handsome figures. For insurance, there was an additional charge in respect of this half year of £264, due to the covering of air-craft risks. They had protected themselves so far as was possible. The allowances to dependants of employees on active service, £169, was so small that reference to it was hardly needed. On the other side, as stated in the report, sales of gas had fallen off by 2·2 per cent.; and the proprietors would be thankful that things were no worse. The result was not so bad as it looked, because public lighting had been about halved, and the 6 million cubic feet and more thus lost was roughly the figure of the total falling off. So that on the important part of the business—the supply of private consumers—they had not lost ground. Owing to the increase in the price of gas, the receipts for this alone had gone up £1305. The rise was only 2d., which was not very much, when compared with an increase of something like 60 per cent. in material employed. It was his hope that they would not have to call on the consumer to any greater extent in the future. Residuals altogether realized £507 more; and it would be noticed that for ammoniacal liquor they had received only £509, which was an absolutely inadequate figure to bring to account, and disclosed the invidious position the Company occupied with regard to the treatment of their residuals. For some reason passing his wit, the Company gave up their rights to deal with residual products in 1884; and, of course, they must have lost a tremendous lot of money over this. They were now struggling to recover these rights. Unaccounted-for gas figured at 5·3 per cent. (including 1 per cent. used on the works), which would be regarded as satisfactory. The total receipts were £1685 more, and the expenditure £4270 more; so that the profits were less by £2584. They were thus £1628 short of requirements; but this

was not a very important matter, when it was remembered that repair and maintenance charges aggregated over 12½d. per 1000 cubic feet, and each 1d. was equal to nearly £1300. Had they been contented with a normal figure for repairs, there would have been a surplus rather than a deficit. Repairs and maintenance of works included charges amounting to nearly £900 in connection with plant erected at the works partly in replacement and partly to strengthen equipment. As to the future, there was a great deal of cause for anxiety. There was no prospect of doing better with regard to coal. The cessation of the war would, however, he thought, have a very great effect on the supply of oil, which would probably be cheaper. While present conditions existed, every practical economy was being enforced that was consistent with maintaining efficiency and pushing the business as far as possible. He concluded by moving the adoption of the report and accounts.

Mr. A. F. PHILLIPS seconded the motion, which was carried unanimously, without discussion.

The CHAIRMAN proposed, Mr. G. W. CAREY seconded, and it was agreed, that dividends should be paid at the rate of 5 per cent. per annum on the preference stock, 12½ per cent. per annum on the "A" stock, and 9½ per cent. per annum on the consolidated stock—all less income-tax—amounting together to £5870, and leaving £37,406 to be carried forward.

Proposed by Mr. PHILLIPS, and seconded by Mr. CAREY, the retiring Directors (Messrs. J. M. Miles and A. M. Paddon) were re-elected, as also was the retiring Auditor (Mr. H. A. Floate), on the motion of Mr. F. H. PILLEY, seconded by Mr. J. T. WESTCOTT.

The CHAIRMAN proposed a hearty vote of thanks to the Engineer and General Manager (Mr. J. W. Buckley), the Secretary, and the executive officers generally, for their services during the six months. He referred to the trying time that had been experienced, and to the excellent way the whole of their duties were carried out.

Mr. E. L. BURTON seconded the vote, which was heartily passed, and suitably acknowledged by Mr. BUCKLEY.

The meeting was brought to a close with a cordial vote of thanks to the Chairman and Directors, which was accorded on the proposition of Mr. H. MITCHELL, seconded by Mr. K. R. MACKAY.

RICHMOND GAS STOVE AND METER COMPANY, LIMITED.

The Twenty-Fifth Annual General Meeting of the Company was held at Warrington last Thursday, when accounts were submitted showing that the balance standing to the credit of profit and loss account (less debenture interest and contingent reserve, and after providing for depreciation of investments) was £38,111.

The CHAIRMAN (Mr. T. Dwerryhouse), in moving the adoption of the report, said he hoped the shareholders had come to the conclusion that it was a satisfactory one. The year's business had been extremely trying, owing to the continual changes in the prices of materials, to the scarcity of workmen, and to the unrest as regarded wages. He was glad to be able to say that, despite all these drawbacks, the Directors had been in a position to submit a report which would compare favourably with those presented in previous years.

Mr. H. M. THORNTON, in seconding, said the balance-sheet must give the greatest satisfaction to the shareholders. The operations of the year, with its resultant financial success, had further strengthened their already strong position, and would undoubtedly assist them to face in the future the many difficulties which must result from the colossal struggle in which the nation with their allies were now engaged. It was a matter of great satisfaction that their business, both in peace time and in war, was recognized to be of national importance. It was not sufficiently known at the present time that it was from the manufacture of coal gas that many indispensable constituents required by the country to-day were largely obtained; and it was, therefore, a national necessity that coal gas should be used in increasing quantity. This reason alone made it clear that their manufactures were of the greatest importance to the country at the present time; for without the apparatus which they and other gas-stove makers supplied, and the renewal parts required for the maintenance of the several millions of stoves already in use, the present great consumption of gas would not be taking place. It should also be realized that, in assisting the nation by consuming gas for all and every purpose, they were also helping forward that economy in expenditure which was so strongly recommended for all; for with the present price of coal, and the difficulties of getting it, gas was undoubtedly cheaper to use for most purposes. With the present and prospective shortage of domestic and industrial labour, they could realize how helpful and necessary their manufactures were to all who lived and worked within the reach of gas supply. In the short space of time at his disposal it was not possible to survey the whole field of their operations; but he would like to mention briefly the important further developments they had made in the supply of industrial apparatus, particularly gas-furnaces. They were fortunate to lay the foundations of this department long before the war commenced; and by the gradual building up of entirely new and economical types of furnaces, they were ready for the great demand they had since experienced. Another department which had strained their resources of output was that of large cooking apparatus for hospitals and canteens, industrial works, &c.

The resolution was carried, and a dividend, free of income-tax, was declared at the rate of 10 per cent. per annum (less 5 per cent. already paid), and a bonus of 6d. per share.

Mr. JOHN A. RANSOME, replying to a vote of thanks to the staff and officials, said they had had a difficult time; but their men had loyally supported them. Some hundreds had gone to the front; and those who remained had in many cases had to alter their work and arrangements, but had met the alterations and different conditions willingly.

Mr. SLACK, speaking to a vote of thanks to the Chairman, said this was the "Silver Wedding" of the Company—in other words, that it had been in existence for 25 years. During the whole of this time it had made rapid progress; but this progress had never been greater than it had been during the last fourteen years.

STOCKPORT CORPORATION GAS MATTERS.

At the last Meeting of the Stockport Gas Committee, the Engineer (Mr. S. Meunier), reporting upon the question of resetting certain of the inclined retorts during the ensuing summer months ready for next winter, stated that he had been considering the question of replacing these retorts with chambers, in order to increase the capacity; and he submitted a sketch plan of the proposed alteration. The Committee resolved that the question be referred to the Sub Committee appointed to consider the matter of the extension of the carbonizing plant.

At the same meeting, Mr. Meunier reported upon the steps that were being taken by the various producers of sulphate of ammonia with a view to having the restrictions on export licences removed; and upon the advisability of installing a plant to be used in connection with the ammoniacal liquor stills for the concentration of such liquor. He submitted approximate quotations for a plant. The Committee resolved to defer consideration of the matter to the next meeting.

The Engineer also reported upon the question of an alteration in the matter of deposits on new mains and services being paid by applicants for a supply of gas; the reason being that all borrowings for these purposes had been stopped by the Local Government Board and the Treasury. The Committee resolved that Mr. Meunier be authorized to expend a sum not exceeding £100 out of revenue on such extensions.

FARMERS AND SULPHATE OF AMMONIA.

Reference was made in last week's issue of the "JOURNAL" [p. 546] to a meeting of the West Riding of York War Agricultural Committee, at which there were some criticisms of the price of sulphate of ammonia. The statements then made, and some editorial comments in the "Yorkshire Post," have led to the addressing of a letter to that paper by Mr. Richard Coates, B.Sc. (District Agricultural Adviser to the Sulphate of Ammonia Association), in the course of which he says:

> The farmers' standpoint has been given considerable prominence of late; but perhaps a brief survey of the other point of view would not be out of place.
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> In the first instance, it is not true that farmers, as a body, are opposed to using sulphate of ammonia at its present price. Large quantities are being bought every day by farmers; but, of course, there is a minority who cannot see their way clear to change from their usual methods of manuring, and, like all minorities, they have the faculty of making themselves heard. We remember about five or six years ago sulphate of ammonia was costing us about 12s. a cwt.; and we sold our wheat at from 35s. to 40s. a quarter, and other cereal crops at lower prices. Sulphate of ammonia was then considered to be a profitable "dressing," and there was little or no opposition to this view. Now, with wheat selling at about 60s. a quarter, the same manure is said to be prohibitive at 16s 9d. to 17s. per cwt. Does it sound reasonable? After all, the farmer only need apply 1 cwt. of sulphate of ammonia per acre, and for this may confidently expect an increased yield of at least 6 bushels of wheat per acre. The average increase will no doubt turn out to be even greater. But on this basis his profit would work out thus: Increased yield, 6 bushels at 60s. per quarter, 45s.; cost of sulphate of ammonia (say), 17s.; profit, per acre, 28s. Wheat could fall to 45s. a quarter, which is the guarantee price recommended by Lord Milner's Committee, and the margin would still be larger than it was in 1910.
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> Furthermore, sulphate of ammonia is costing considerably more to produce now than before the war. Competent authorities estimate this increase at £4 5s. a ton; yet we are told that no more should be charged for it. If this is so, surely it is fair to assume that wheat, barley, beef, and mutton should still be selling at pre-war prices. But they are not! If we offered a parcel of nitrate of soda at £12 17s. 6d. a ton to any of the gentlemen who, as farmers, are grumbling about the price of sulphate of ammonia to-day, they would probably snap it up, and think they had a good bargain. Yet at that price their "nitrogen" (which is what they are buying) would cost them the same per unit as it does in sulphate of ammonia at £16 15s. a ton. Only this week, a manure merchant gave me his price for nitrate of soda at over £17 a ton. Taking these facts into consideration, is sulphate of ammonia so prohibitive in price?

THE OPPORTUNITIES OF THE GAS INDUSTRY.

The President of the American Gas Institute for the year 1906 was Mr. B. W. Perkins; and he contributed to last month's issue of the "Gas Institute News" a brief editorial pointing out that the opportunities that were present and not known in 1879—*i.e.*, the year of the "Gas-Electric Scare"—are largely here to-day and need but a slight departure from old and accepted ways to be developed.

He wrote: "In looking over a scrap-book recently an article from the Chicago 'Inter-Ocean' of Dec. 22, 1879, describing Edison's successful demonstration of the incandescent electric light at Menlo Park was found; one of the head lines being 'The Knell of Gas Companies Sounded by the Little Man from New Jersey.' How near this prediction has been verified, the reader can guess. Figures are not at hand to compare the gas business of to-day with that of 1879; but it is safe to say it is many times greater than the difference in population of the two periods. This sets one thinking as to the cause, and to wonder if the same efforts put forth in new directions would not produce the same results at the present time.

"Undoubtedly, the advent of electricity as a competitor was the first real stimulant the industry had. Taking advantage of opportunities

that had been overlooked, practising economies in the manufacture and distribution, and giving the public the service they deserved, were others.

"When it is considered that the gas industry has a very active competitor in the field with an invested capital of over $2,000,000,000, it emphasizes what intelligent effort will do. The question arises: 'Have all the opportunities been grasped?' The writer is of opinion they have not. Gas as a domestic fuel has been fairly cultivated, water heating to a less degree, industrial uses still less, and all-the-winter house-heating practically none.

"It is not always expected that gas as a fuel will compete in actual outlay with other fuels; but its additional advantages ought and will get the business. And while it is contrary in a general way to present practices, the example of the electric companies might be followed, by giving a very low rate for certain classes of business.

"Tar generally is considered as a substance for roofing and road building, and brings a price as such. While it is a fact that it is a very valuable product if properly worked up, it should receive the attention of the Institute; for interesting capital for the promotion and establishment of plants in various parts of the country, gas companies might be induced to become stockholders in such a plant."

GAS LIGHTING IN TRAINS.

The Jarrow Railway Accident.

There has been issued from the Railway Department of the Board of Trade the report of Colonel P. G. von Donop on the result of his inquiry into the railway accident which occurred near Jarrow on Dec. 17 last. Reports of evidence at the Board of Trade inquiry, so far as it concerned our readers, appeared in the "JOURNAL" for Dec. 28 last, p. 720, and Jan. 25, p. 216. The following extracts, bearing on the subject of gas lighting for trains, are from Colonel Von Donop's report.

After describing the state of things existing at the time of the accident, Colonel Von Donop says:

All the vehicles of the up train, and, with one exception, all those of the down train, were lighted by means of gas; each vehicle having two, three, or four cylinders housed underneath it, well up into the frame. The following are the details of the gas-cylinders on the three vehicles which were burnt on this occasion, and the condition in which those fittings were found after the accident. The leading vehicle of the up train was fitted with three gas-cylinders—one near its front end and two near its rear end. The front cylinder was knocked off the coach by the force of the collision; and it was found lying under the cab of its engine. It was burst at both ends. One of the rear cylinders was also burst at both ends, and the other was delved in at the bottom, though apparently not broken. All the connections of these cylinders were, however, broken away; and it may be regarded as certain that all the gas from two of these three cylinders escaped before the fire on the coaches broke out. The second vehicle of the up train was fitted with four gas-cylinders—two at either end. They were all intact, except the leading right hand one, which had a connection broken and its straps shifted. The low-pressure pipes were, however, severed in the case of all the cylinders. The leading vehicle of the down train was fitted with three gas-cylinders—two at its leading end and one at its rear end. The two front cylinders were found in good order and in position on the underframe; but the rear one was burst at one end. The pipe connections of all these cylinders were also broken.

Having dealt with his conclusions as to the cause of the accident, Colonel Von Donop reports as follows regarding the fire which broke out after the collision:

It is agreed by all the witnesses that the fire did not break out till some few minutes after the collision occurred, and that it broke out on one of the leading vehicles of the up train; but the witnesses disagree as to whether it originated on the first or on the second vehicle of that train. As, however, it was dark at the time, and as those two vehicles were telescoped together, this difference of opinion is not surprising. The most reliable evidence on this point is given by driver Tolliday, who was travelling as a passenger in the up train, and who, being an expert ambulance man, took a leading part in rescuing the passengers. Tolliday had joined the train at Tyne Dock Station, and had tried to enter one of the three compartments of the leading vehicle; but, finding it crowded, he took a seat in the second compartment from the front of the second vehicle. After the collision, he and the four other passengers in that compartment made their escape through the window, and Tolliday proceeded to the signal-box in order to see that the roads were blocked and to send off telegrams for assistance. He then returned to the scene of the accident, and endeavoured to release some of the passengers from the compartment ahead of the one in which he had been travelling—that is, from the leading compartment of the second vehicle; this compartment having been crushed in by the collision. After obtaining tools from the brake-van he succeeded in rescuing three passengers from that compartment, and while he was working to liberate a fourth, the fire broke out. The first he saw of the fire was a small jet rising from the top of the gas-cylinder under the compartment at which he was at work; and he is quite certain that when he first saw it it was solely a jet of gas. At that time, he states, there was no fire burning on the engine of the up train, or on the leading vehicle of it. He at once sent for extincteurs, and used one of them under the carriage; but though he is well acquainted with their use, he failed to check the fire thereby, and he then saw that the wood-work of the carriage had also caught fire. He then used a second extincteur from the side of the carriage, but still without effect. As the fire was now spreading to the top of the carriage, he got on to the roof and used a third extincteur from that position; but still without any success at all. He then succeeded in rescuing one more passenger from the leading compartment; and it is feared that there were still two passengers left in it. But the heat was then too great for him to be able to do anything more. Tolliday is positive that the leading vehicle, the brake third, caught fire from the second vehicle, and was consumed very rapidly; but it is thought that there was no one alive in that vehicle at the time.

The leading vehicle of the down train appears to have caught fire from the vehicles of the up train, though there is no conclusive evidence on this point. The remaining vehicles of both trains were promptly uncoupled and drawn away. It was not until the fire brigade arrived, about an hour later, that the fire on the three vehicles was finally extinguished.

Another witness, guard Dunlop, who was at the time near the scene of the accident, and who reached the front portion of the train before any of it was on fire, thinks that the fire broke out in the front portion of the leading carriage, and that it seemed to originate from the bottom of it. Guard Taylor, who was in charge of the down train, thought that the fire came from the roof lamps; but as this witness did not see the fire until it was burning fiercely, his evidence as to its origin is not convincing. Brake-examiner Redican, who was travelling in a rear vehicle of the up train, went to the front of the train after the collision and assisted in rescuing the passengers. At that time none of the vehicles was on fire. He thinks that the fire originated on the second vehicle; but he cannot say on what part of it.

The evidence appears therefore to point to the fire in this instance having originated with the ignition of a jet of gas which was escaping from one of the gas-cylinders of one of the leading vehicles, that this gas-flame then set light to the wooden upper portion of that vehicle, and that that in turn set light to the inflammable portions of the two other vehicles which were lying near it. It is quite possible that the gas may have been ignited in the first instance by some hot cinders or ashes which fell from one of the engines when it was derailed; but it seems certain that it was the gas which was in some way first ignited, and not the inflammable portions of the vehicles.

There have been a large number of railway accidents during recent years which have been accompanied by fires. In some of these—such as those at Witham, Grantham, Hawes Junction, and Ditton—it was found that the fires had originated with escaping gas; while in others—such as the Aisgill and Gretna accidents—escaping gas was found to have intensified the fires, which had originated otherwise. In this instance, the evidence that the fires originated with gas is more definite than in any previous case; and it furnishes therefore a very conclusive object-lesson as to the additional danger which is caused in the case of an accident by the presence of gas on the train.

The Board of Trade reports on the above-named accidents, and on several others, have included a recommendation that, on the ground of safety, electricity should be adopted for the lighting of trains, in preference to gas; and after each of the Hawes Junction, Ditton, and Aisgill accidents the Board specially addressed all railway companies on the desirability of this being done.

As regards the North-Eastern Railway Company's action in this direction, the Company's representatives state that during the last three years all new passenger vehicles which have been built have been fitted with electric light, and that all which will be built this year will also be so fitted. In Appendix II. is shown a return on the subject, furnished by the Company, and from this it appears that, on Dec. 31 last, out of a total number of 4241 coaches owned or maintained by them, 626 were lighted by electricity. A certain amount of progress is therefore being made as regards the fitting of new stock, though the Company have not undertaken, as several other companies have done, that all their new stock shall be so fitted, nor have any steps been taken by them towards the conversion of the existing gas-lit stock. It is hoped that the occurrence of the fire in connection with this accident may at all events lead the Company to the adoption of a definite decision in favour of electric lighting for all new stock and for the gradual conversion of the gas-lit stock.

Certain recommendations were also made in Board of Trade reports with the view of rendering gas-lit coaches less liable to danger from fire, pending their conversion—*e.g.*, the provision of safety valves, strengthening gas-cylinders and housing them more securely, and the use of non-inflammable material for coaches. The Company state that all these matters have been, and are still, under their consideration. The gas-cylinders are now being more securely housed, and on 334 coaches incandescent lighting has been introduced, with the result that one gas-cylinder suffices for each carriage in lieu of three or four. But the safety valves which have been tried have not been found reliable; and, with the exception of the electrically-propelled stock, practically nothing has been done as regards the use of non-inflammable material. This accident shows that, pending the conversion of the gas-lighted stock, further action in these matters is called for. Such expedients can, however, only be regarded as temporary ones, and not as permanent substitutes for conversion to electricity as recommended above.

The War and Gas Supply.—Some editorial remarks on the subject of popular complaints of bad gas in the "Sanitary Record" conclude with the following sentence, giving expression to a feeling which it is a pleasure to acknowledge: "We hold no brief for the gas supply authorities; but when we find an agitation without reasonable foundation being worked up against an industry that is carrying out a patriotic duty at considerable inconvenience and with slight financial recompense, we consider it our duty in all fairness to put before our readers such facts as are within our knowledge."

Lewes Gas Company.—The past half-year's accounts showed a balance on net revenue account of £4679; and the Directors of the Company recommended dividends for the six months at the rate of 4 per cent. upon the original capital stock, and £2 16s. per cent. upon the additional capital stock—amounting to £994. In making this recommendation, the Directors added their regret that, owing to the largely increased cost of coal and other materials, and the difficulties created by the war, they were unable to propose the usual rates of dividend. At the meeting, when the recommendation was agreed to, the Chairman (Mr. Montague Blaker) said the output of gas had been less, and expenses higher; but upon the whole the accounts could be regarded as fairly satisfactory. Twenty-four of their men had joined the Army.

STOCKPORT GAS-WORKS ARBITRATION.

Union Complaints of Non-Compliance with the Award.

At the last Meeting of the Stockport Town Council, the minutes of the Gas Committee which were submitted for approval showed that further questions had arisen out of the terms of settlement reported in the "JOURNAL" for Jan 11 [p. 99] and Feb. 8 [p. 322]. The Secretary of the Municipal Employees' Association (Mr. P. J. Tevenan) alleged non-compliance by the Committee with the award of Mr. Lynden Macassey, K.C., albeit the Corporation had increased the rates of pay to stokers and to carters since the settlement was arrived at.

The Engineer (Mr. S. Meunier) reported that, in accordance with instructions, he had communicated with the Chief Industrial Commissioner (Sir Geo. Askwith) regarding the following complaints put forward by the Municipal Employees' Association of alleged non-compliance with the award, and had asked for a decision on the points raised: (1) That the blacksmith's strikers were not being paid 29s. 6d. weekly, as arranged. (2) That exhauster men (with reference to whose lately re-arranged terms of wages and work no objection was raised) should be paid 39s. 9d. per week, instead of 5s. 2d. per shift, with time-and-a-half for Sunday; or 38s. 9d. for a seven-shift week. (3) That jointers were not being paid at the rate of 7½d. per hour. (4) The Association also raised the question of a man named Brereton, who was only in receipt of 17s. 6d. per week, and whom they classed as a dining-room attendant; and of three men who acted as watchmen at the Heaton Lane Gas-Works, working 56 hours per week, as against the ordinary 53 hours, for the labourers' wage of 27s. 6d. per week.

Mr. Meunier stated that, with reference to (1), the men are receiving 29s. 6d. per week, which was submitted by him at the time as being the standard rate of the town. Subsequent inquiry, however, appears to point to the fact that local engineering firms have not had a standard rate, and that their pre-war payments varied from 22s. to 27s. per week, to which, by arrangement, has lately been added a war increase of 3s. per week. The Gas Department's pre-war rate was 6d. per hour for a 53-hour week—*i.e.*, 26s. 6d.—to which the 3s. was added, making the present wages 29s. 6d.—a higher rate than is paid by the majority of the local firms. The Manchester standard rate is 29s. per week. (2) The actual arrangement is as follows: Per day, 5s. 2d.; per week, seven shifts, 38s. 9d.; no payment for lost time of any kind, either through sickness or other cause. Floor of engine-house to keep clean, also windows and skylight. When the works are shut-down for eight or sixteen hours, time to be employed in cleaning, gland-packing, &c., which would not be done at an ordinary time. This amount is being paid. No explanation as to how the 39s. 9d. mentioned by Mr. Tevenan is made up was submitted; the sum simply being claimed as the amount agreed upon at the inquiry. (3) We have only one man classed as a jointer; and he is paid the awarded amount when on this work. When, as at present, no mainlaying is going on, he receives 7d. per hour, or ¾d. per hour over labourers' rate, as a handy man. There are two other men who occasionally make joints, and who, when doing so, would receive jointer's pay, but who are at the moment working as labourers, at labourers' rates. (4) At the last settlement for increases in 1912, Brereton's case was agreed to be dealt with as a special one. With regard to watchmen, the three men at Heaton Lane Gas-Works are not quite the usual type of watchmen; to the ordinary duties being added the charge of valves, &c. The work is very light, and takes up little time; but, in consideration of it, the Committee have paid the ordinary labourer's weekly rate, now 27s. 7d. (though for the seven shifts of eight hours, as against the ordinary week of 53 hours), instead of the usual 3s. per night.

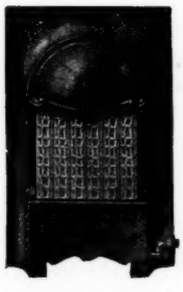
The Chief Industrial Commissioners' Department have replied that: (1) Blacksmith's strikers are not included in the award, as no claim was made before Mr. Macassey in respect thereof; and therefore there can be no case of non-compliance with the award. (2) The same answer as in (1) applies to the case of the exhauster-men. (3) In regard to jointers, the only case argued at the hearing was that of a man classed as a jointer; and he should receive the rate awarded—viz., 7½d. per hour—both when he is jointing, and when, for lack of jointing work, he is doing labouring work. No question was raised at the hearing as to the ratings of dining-room attendants or watchmen at the Heaton Lane works or elsewhere; so that the award does not include them.

Arising out of this, the Gas Committee subsequently considered a request of the Association that the men at Heaton Lane Gas-Works who worked 56 hours per week, as compared with 53 by the ordinary labourers, should be paid for the extra three hours; but the Committee declined to interfere with the rate of pay of the dining-room attendant.

The foregoing decision of the Committee having been communicated to the General Secretary of the Association, an acknowledgment was received, stating that the case of the workmen had "been fully and even generously met; and that this would put an end to any further complaint on their side." The General Secretary added: "On behalf of the other sections [of workmen], I must tender to the Committee my sincere thanks; and, taking everything into consideration, the concession granted to the men should make them fully interested in their work and more contented than they have been for many years."

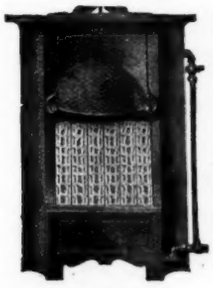
Further Bonus for Manchester Gas-Workers.—On the top of the 2s. per week war bonus granted by the Manchester City Council to workmen earning less than 40s. per week, the Gas Committee have resolved that, subject to the men making full time, all workmen engaged inside the works (other than tradesmen) shall be paid a special war bonus of 3s. per week. Workmen certified as sick or injured, and losing time in consequence, are not to be disqualified thereby. The proposal has been approved by the City Council.

The MAIN D.S.O. Fires



"DEPENDABLE."
(Reduced Type.)

"SYMMETRICAL."
(Reduced Type.)



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SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *March* 13.

The price of pitch remains unchanged; makers' quotation still being 19s. to 19s. 6d. per ton net at works. A certain number of shipments continue to be made, and there seems to be a somewhat better demand in the home market—both for fuel and carbonizing purposes. Solvent naphtha 90-160 is firm at 2s. 2d. to 2s. 3d. per gallon, net and naked; 48-50 anthracene is 2½d. per unit, net, casks included; creosote is steady at 4d. to 4½d. per gallon, net, in bulk, at makers' works.

The position as regards sulphate of ammonia remains unaltered, and export business is practically at a standstill in the absence of export licences. During last month, the quantity exported amounted to 19,895 tons; being a reduction of 12,089 tons as compared with the corresponding month of last year. Prices are quite nominal.

Tar Products in the Provinces.

March 13.

The market for pitch remains unchanged. Creosote is still very weak. Some business is reported in solvent naphtha at slightly lower prices; but heavy naphtha is in good demand.

The average values of gas-works products during the past week were: Gas-works coal tar, 16s. to 20s. Pitch, East Coast, 15s. to 16s. per ton; West Coast, 14s. to 14s. 6d. Manchester; 15s. to 15s. 6d. Liverpool; 17s. to 17s. 6d. Clyde. Benzol, 90 per cent., North, 10½d. to 11½d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 7d. Solvent naphtha, naked, North, 2s. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2½d. to 2⅝d. Heavy oils, in bulk, 3⅝d. to 4d. Carbolic acid, 60 per cent., East and West Coasts, 3s. 4d. naked. Naphthalene, £18 to £28; salts, 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *March* 11.

The Government have maintained their policy of refusing to issue licences for the export of this material to neutral countries, and the demand for shipment to British Possessions has not been on a large scale; nor have orders for home consumption been plentiful. The nominal quotations are still £16 17s. 6d. per ton f.o.b. Hull, £17 f.o.b. Liverpool, and £17 5s. f.o.b. Leith, though it is reported that, on the one hand, some producers have realized 2s. 6d. per ton more, while, on the other hand, second-hand sales have been made at 2s. 6d. per ton less money. There is no new feature in the forward position, and buyers and sellers both seem to have adopted a waiting policy for the time being.

Nitrate of Soda.

This market is again dearer on spot, and to-day's prices are 17s. per cwt. for ordinary, and 18s. for refined quality.

Sulphate of Ammonia.

From another source it is reported that outside London makes are quoted at £16; Hull, £16 12s. 6d. to £16 15s.; Liverpool, £16 15s. to £16 17s. 6d.; Leith, £16 17s. 6d.; Middlesbrough, £16 15s.

COAL TRADE REPORT.

Northern Coal Trade.

There is quietness in the northern coal trade. This is due largely to the delay of steamers, and the consequent inability to ship coal freely, and very high freights are needed to obtain tonnage. In the steam coal trade, there is fair activity under the circumstances, and the prices are on the whole well maintained. Best Northumbrian steam coals are from 32s. 6d. to 35s. per ton f.o.b.; for second-class steams the quotation is near 29s. per ton; and steam smalls are steady at 15s. to 17s. per ton, with a fair inquiry. The output of steam coals is fairly good, and it is taken up with only the delay occasionally due to the non-arrival of vessels. In the gas coal trade, there seems to be rather more interruption. The current quotations are about 26s per ton f.o.b. for best Durhams; second-class gas coals are near 24s. per ton f.o.b.; and "Wear Specials" are steady at 27s. per ton f.o.b. For forward delivery, these prices are generally asked, though there are many contracts running at lower figures. The freights continue high, to Italy especially; and one effect has been to reduce the export of gas coal to that country. As high as 96s. per ton has been paid as freight on coal Tyne to Genoa. Very naturally the high costs lessen forward business for export. It is rumoured that considerable purchases have been made of gas coals for one of the great Metropolitan companies, and it is believed that they are on the basis of the Price of Coal (Limitation) Act, but details are not yet given. Coke is steady. Gas coke is in good demand; the price being about 27s. 6d. to 29s. per ton f.o.b. in the Tyne. Shipments of coke from the Tyne this year are about double the quantity sent out in the same period of last year.

Perth Gas-Workers' Wages.—The Perth Gas Committee have had submitted to them the award of Sheriff Mackenzie, of Inverness, which gives the Corporation gas workers an increase of 2s. per week, dating back to last December. The men claimed an advance of 1d., per hour, and the amount awarded to them represents about one-half this sum.

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MELTING

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New Burner Unparalleled for Effectiveness.

An outstanding feature of this Furnace is the new Wright-Brayshaw Patent Burner. Its construction avoids the defects hitherto inherent in the best of the existing types of Burners, and it will be found to give results, in increase of heat and decrease of fuel consumption, far beyond anything attained by any other burners.

1½ cubic feet of Gas per lb. of Brass Melted.

In actual work (not a fancy test) this Furnace has melted brass with a gas consumption under 1½ cubic feet per lb. of metal melted.

Write for full particulars of apparatus to

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Essex Works, Aston, BIRMINGHAM.

Oldham Coal Deliveries.

At last Wednesday's meeting of the Oldham Gas Committee, the question of coal supplies for the works was considered at length. Mr. Arthur Andrew (the General Manager) reported that there had been a further decrease in the supplies, as compared with the quantity usually furnished, of nearly 900 tons on the fortnight. Mr. Tim Duxbury (the Engineer) stated that three or four weeks ago they were 15,900 tons behind; and this state of affairs still continued. Contracts which should have started last June or July had not begun delivery yet. A return submitted to the meeting showed that in eleven cases a total of 3870 tons had been delivered in excess of contracts; while on thirteen other contracts they were 16,016 tons short. On one contract for 5500 tons, placed last May, no coal had yet been delivered. Replying to a member, who asked if the Engineer was likely to be seriously inconvenienced by this condition of affairs, Mr. Duxbury replied that for the present he thought they were all right; but for the next winter it would be more difficult. They wanted to have 28,000 to 30,000 tons in stock at the beginning of next October. It was suggested in Mr. Andrew's report that the Committee might consider the advisability of purchasing further supplies, so as to be sure of stocks; and this course was eventually agreed to, if deemed desirable by the Chairman of the Committee (Alderman H. Wilde, J.P.) and the General Manager.

Consumption Maintained at Tonbridge.—Notwithstanding very vigorous restrictions as to lighting, &c., the consumption of gas at Tonbridge was maintained during last year, although the comparison was with a heavy increase in 1914—the highest for many years. Making this statement at the recent annual meeting of the Company, the Chairman (Mr. W. Judd) added that up to Sept. 30 last gas was supplied at the old price; but then an increase of 4d. had to be made, though this left the price at the favourable figure of 2s. 9d. per 1000 cubic feet. Out of 42 men employed by the Company before the war, only seven remained, including one stoker. The dividend, though slightly reduced, had been well earned. There had been a considerable advance in wages for the year, due principally to war bonuses and allowances to dependants of men who had joined the Forces. They had also thought it prudent to insure against air-craft attacks. Such results as were now presented were mainly possible owing to the policy of the Directors of strict economy in the past, and by the erection of the most up-to-date appliances, which had brought the plant to a high state of perfection, of which they were now reaping the advantage. In this connection, he testified to the invaluable assistance they had received from the Manager (Mr. J. Donaldson). The report was adopted, and dividends were declared at the rate of 13½ per cent. per annum on the "A" stock, 10½ per cent. per annum on the "B," "D," and "E" stocks, and 5 per cent. per annum on the "C" stock, for three months, and 12¼ per cent. per annum on the "A" stock, 9¾ per cent. per annum on the "B," "D," and "E" stocks, and 5 per cent. per annum on the "C" stock for three months.

Stretford Gas Company.

Presiding at the half-yearly meeting of the Company, Mr. W. A. Nicholls (the Chairman) said that, considering the period of exceptional difficulty through which all gas undertakings were passing, the working was eminently satisfactory. The balance of £5008 was just over what was necessary to pay the dividends. This result had been brought about by economies and foresight. What the future might be he would not predict. It was gloomy, indeed; but with a balance in hand of undivided profits of over £2500, he had not the slightest doubt that they would weather the next six months without any trouble. The Company had attained their results by advancing the price of gas less than their neighbours—viz., 3d. and 4d. per 1000 cubic feet—and three months later than most of them; so that they had not been unduly hard on their consumers. The figures proved this, as coal and oil had cost £4446 more, whereas the gas-rentals had only increased £2734. They had insured the works against aircraft raids. In connection with the residuals, the outlook for tar and ammonia, owing to restrictions in shipping and exports, was bad; there was no market for pitch; and creosote and sulphate were overflowing the stores. An outlet for some of the pitch could be found on the gas-works. Mixed with coal, it could be carbonized without loss to the Company; and they had been using it for this purpose for over two months. He hoped every gas-works would do the same, and so save the market from further ruin. The Deputy-Chairman (Mr. E. Hibbert), in seconding the adoption of the report and accounts, said that, though the consumption of gas was rather lower than in 1914, there was nothing to be alarmed at. The day consumption had increased all over the district, and on the industrial load alone by over 11,000,000 cubic feet. The numbers of consumers, cookers, fires, and other apparatus were all increasing. The motion was carried, and the usual dividends declared. Replying to a hearty vote of thanks, Mr. H. Kendrick (the Engineer and Manager) and Mr. William Blundell (the Secretary) stated that their efforts would have been unavailing had they not been loyally supported by everyone in their employ, from the youngest boy in the office to the oldest stoker in the retort-house. The shift workmen had worked extra hours doing other duties for weeks past; and so far as the workmen were concerned, they had never had so comfortable a winter.

Employment of Women as Meter-Readers.—The Manchester Gas Committee have decided to engage, on probation, six women as meter-readers, for temporary employment only. This is a purely precautionary measure, in anticipation of some of the regular meter inspectors being required for service with the forces. It has been decided that applicants must be not less than 25 years of age; and, all things being equal, preference is to be given to widows of employees in the department who have lost their lives in the war. The women are to be trained for duties in the suburbs of the city only; warehouses, works, and offices being left to the male employees.

"Progress," wrote an old philosopher, "is the worthiest pursuit of human endeavour."

¶ The entire facilities of The Davis Gas Stove Co., Ltd.—research, technical, manufacturing, and selling—are dedicated to the progress of Gas—progress based upon a solid foundation of scientific verity.

¶ There is nothing altruistic in this, for we believe that whatsoever in our own sphere is for the benefit of Gas, is necessarily of the highest advantage to ourselves and to our clientèle. The justification of our faith lies in the growth of our prestige.

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The Fatality at the Derby Gas-Works.

The circumstances of the recent fatal accident at the Litchurch Gas-Works, Derby, were investigated by the Coroner last Tuesday. The victim was James Shaw, a stoker and mechanic, aged 43, who was crushed to death by a machine weighing 3 tons. Deceased was in charge of an appliance driven by electric power; and manipulating the control in the wrong way, he caused it to be overwound, and thus placed out of action. For the purpose of rectifying the mishap, a jack was got into position; and this had raised the machine, when it swayed slightly, and both jack and machine collapsed, pinning Shaw and a man named Fox to the ground. Shaw's death was practically instantaneous; while Fox was found to have had both legs fractured. The evidence disclosed that machines of the type to which the accident occurred had been in use at the works for many years without any previous mishap; but Mr. J. Ferguson Bell (the Engineer and Manager) informed the Coroner that he was arranging with the makers for certain additions which would obviate the possibility of overwinding. The Jury returned a verdict of "Accidental death."

Cowes Gas Undertaking.—At last Wednesday's meeting of the Cowes District Council, it was reported that about a hundred applications had been received for the vacant managership of the gas-works. The tender was accepted of Messrs. Drakes Limited, for two patent regenerator furnaces and two beds of eight retorts (in arches provided by the Council), sixteen mouthpieces, for an inclusive sum of £483. It was stated that this was a portion of the scheme for improving the plant at the gas-works which had been sanctioned by the Council. Mr. Richardson said the present plant was not only inadequate for the growing demands of the town, but a great portion of it was obsolete. A similar scheme was recommended in 1907 by the late Mr. E. H. Millard, who pointed out how essential it was to carry out the work. They were not then able to do what was necessary, for reasons which were well known to the members.

Bristol Water-Works Company.—It was reported at the annual meeting of the Company that the revenue for 1915 from water-rates was £170,166, an increase of £4869 when compared with the previous year. The amount available for dividend on the ordinary capital was £81,502; and final dividends were declared at the rates of 8½ per cent. per annum on the ordinary shares, and £5 19s. per cent. per annum on the ordinary stock, leaving £10,245 to be carried forward. The Chairman (Mr. H. N. Abbot) remarked that if the consumption went on increasing as it threatened to do, they would before long have to look out for a further supply, to meet the future needs of the community. There was no doubt that Avonmouth was bound soon to go ahead very fast. The portion of the proceedings relating to the retirement of Mr. A. J. Alexander from the position of Secretary and General Manager, and the appointment of his son, Mr. W. A. D. Alexander, as Secretary, is recorded in the "Personal" column to-day.

Gas, Water, and Electricity Charges at Burnley.

The Burnley Town Council have decided upon an all-round increase for gas, electricity, and water. Inside the borough, the water-rate is to be increased from 5 to 6 per cent., and outside from 7½ to 10 per cent. These new charges will change an estimated loss of £7407 into one of £2709. The charge for gas has been increased from 2s. 3d. to 2s. 6d. per 1000 cubic feet by ordinary meter; while the prepayment meters will give 29 cubic feet, instead of 32 feet, for 1d. The revised charges will turn an estimated loss of £4700 into a profit of £3440. There was some discussion as to the unfair treatment of prepayment consumers, who pay cash-down to the extent of 2s. 10½d. per 1000 cubic feet. Alderman Emmott (the Chairman of the Gas Committee) pointed out that it cost a lot more to collect the money from the prepayment meters. Every householder who had a prepayment meter could have an ordinary one if he wished; but the Committee found that, one after another, ordinary meters were being taken out, and the Committee had to scrap them or convert them at considerable cost. They were not all poor people who had prepayment meters. An amendment that 30 cubic feet be given prepayment meter users for 1d. was defeated.

Increased Prices at Ilkeston.—At a meeting of the Ilkeston Town Council last Tuesday, a recommendation of the Gas Committee, sanctioning another increase of 6d. per 1000 cubic feet in the price of gas, was adopted; the Mayor (Mr. J. A. Macdonald), who is Chairman of the Committee, expressing the hope that it was the last time they would have to come forward with such a proposal. A resolution moved by Mr. Lacey, that the question of the increase should be deferred until the next meeting, was rejected. At the same time, it was decided to increase the price for electricity; the statement being forthcoming from the Mayor that the current had been sold at less than it cost locally, when the expense of management, distribution, &c., was added. He also urged that steps should be taken to provide for the depreciation of plant which was bound to take place.

St. Mary Church Gas-Works.—In his report to the Torquay Town Council last week, Mr. F. Chalmers, the Manager of the St. Mary Church Gas-Works, stated that there had been a gratifying increase in the amount of business during the past year. Notwithstanding the adverse conditions caused by the war, more gas had been sold, and there was a larger number of consumers than in 1914. Difficulty had been experienced in getting supplies of coal and other material, and prices had increased enormously. Benzol could not be obtained now, and other spirit had to be used at a cost double that of a year ago; while coal had gone up from 19s. 9½d. per ton to 27s. Labour had not only increased in cost, but there had been great difficulty in securing men intelligent enough and able to carry on the work. This was a difficulty which was not likely to diminish in the near future. The quantity of gas unaccounted for is being reduced gradually from year to year, and now compares favourably with other undertakings.

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Selling Muslin "Mantles."

Two months' hard labour, and a fine of 10s. or seven days for peddling without a certificate, was the sentence imposed by the Magistrates at the Neath Police Court on a man named Patterson, who was charged with false pretences, by selling imitation gas-mantles. A light was applied in court to one of these articles, when it burned away to practically nothing. Defendant called on shopkeepers, represented the "mantles" as being of good quality, and effected sales. He explained to buyers that "British mantles had no names, but German ones had." When taxed with the offence, he stated that he had made the mantles himself from book muslin. He had tried to make good ones, but had not been successful. The fraud must have been more or less profitable, for the police records revealed a "previous conviction" at Weston-super-Mare, for a similar offence.

Plymouth Gas Company's Bill.—Among the minutes submitted to the Plymouth Town Council at their last meeting was one by the General Purposes Committee on the subject of the Plymouth and Stonehouse Gas Company's Bill. This stated that a Sub-Committee had considered the provisions of the Bill, and a report by Mr. Isaac Carr, the Consulting Engineer, and recommended that the Company be asked not to proceed with the proposals with regard to the substitution of a calorific for the illuminating standard and other clauses dependent thereon.

A Test Case under the Coal Prices (Limitation) Act.—The "Iron and Coal Trades Review" last Saturday, in its review of the coal trade, said: "The shortage of supplies experienced of late has become even more pronounced; and there can be no doubt that but for the Limitation Act prices would have risen sharply. As it is, there are more disputes concerning the interpretation of that Act; and we understand that an important test case, in which the London Society of Coal Merchants will support one of their members who has lodged a complaint against a well-known Midland colliery, is to be heard very shortly in the Commercial Court of the King's Bench Division.

Hastings Electricity Undertaking Loss.—In connection with the estimates for the rates for the ensuing year, the Borough Accountant submitted a report to the Hastings Town Council, in the course of which he stated that the estimated deficiency on the electricity undertaking was £6275. Against this loss, however, must be set the saving on public street lighting. The deficiency, he said, was almost entirely due to the loss to the undertaking caused by the restricted lighting orders; the price of coal being only a minor contributory cause. Mr. Mannington, in moving the adoption of the estimates, remarked that it cost them £772 more to have darkness than it did to have light. He feared the electricity deficiency would be more, through economy in light.. Mr. Chesterfield pointed out that there had been a saving of £1289 on gas lighting.

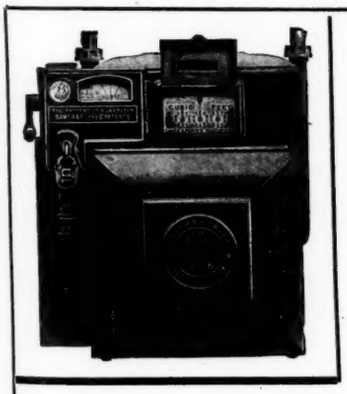
Too Much Light from a Gas-Works.

Summoned under the Defence of the Realm Act for permitting a certain fire to show which might serve as a guide for enemy aircraft, Mr. James Ratcliffe, the Manager of the Alford (Lincs.) Gas-Works, was fined 20s. It was stated that at about 11 o'clock one night, there was a blaze of light for a quarter-of-an-hour from the gas-works chimney. When the police called attention to the matter, defendant explained that the blaze was due to an engine stopping, and could not be prevented. Mr. W. H. Mainwaring (the Manager of the Lincoln Gas-Works) gave evidence to the effect that if a gas-engine suddenly stopped, the flare could not be prevented. The stopping would not necessarily be a sign of neglect, as the attendant might have other duties to perform. Mr. Ratcliffe, who pleaded "Not guilty," pointed out that labour was difficult to secure; and the man in charge of the exhauster engine had to do stoking. It was while thus engaged that the engine stopped—an occurrence which it was at times impossible to prevent—thus allowing the gas to escape, and causing the flare.

Effect of the Lighting Restrictions at Shotley Bridge.—The annual meeting of the Shotley Bridge and Consett Gas Company was held on Friday last—Mr. G. Ainsworth, J.P., the Chairman, presiding. The Directors' report stated that the receipts amounted to £17,831, and the expenditure to £13,879; leaving a profit balance of £3951. After the payment of interest on loans and the interim dividend, a dividend of 5 per cent. per annum, less income-tax, was recommended. The sale of gas showed a slight decrease, which was due to the lighting restrictions. The report was adopted.

High Wycombe Gas Supply.—The operations of the High Wycombe Gaslight and Coke Company, Limited, for the half year to Dec. 31 resulted in a profit of £1333, to which had to be added a sum of £2703 brought forward, and £95 bank interest. After payment of debenture interest, preference dividend, and dividends at the rates per annum of 10 per cent. on the original shares and 7 per cent. on the additional shares, there will remain a balance of £2739 to carry forward. The concrete tank for a new gasholder has been completed; and it is hoped that the holder will be erected by the end of June.

Ulster Gas Undertakings.—At a meeting of the Newtownards Urban Council, it was stated that the Gas Committee had agreed to contribute a sum of £240 towards the relief of the rates. The Cookstown Urban Council have reduced the general town rate from 5s. 10d. to 5s. 8d., as a result of the saving effected by reduced public lighting. The Lisburn Urban Council have resolved to increase the price of gas from 3s. 8d. to 4s. per 1000 cubic feet. The Coleraine Urban Council have acknowledged their indebtedness to the assistance given by the Gas Managers of Ballymena and Portrush, and by local merchants, to enable them to maintain the gas supply, which was threatened by coal shortage—due largely to delay of steamers.



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RADFORD ROAD, NOTTINGHAM.

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Increased Water Charges at St. Helens.—Estimates for the ensuing year, showing that on last year's basis there would be a deficiency of £3500, were considered by the St. Helens Water Committee a few days ago. Last year there was a deficiency of £2400, almost entirely due to the increased cost of coal, &c. It was decided to increase the charge for domestic supplies from 6 to 7 per cent. on the gross rental, and the charge for metered supplies from 7d. to 8d. per 1000 gallons. These increases, it is calculated, will bring in £4200 extra.

Electricity from Waste Heat.—A dividend of 8 per cent. for the past year was declared at the ninth annual meeting of the Waste Heat and Gas Electrical Generating Stations, Limited, which was held last week; and a sum of £500 was voted to war relief funds, to be allocated at the discretion of the Board. It was stated that the total capital expenditure up to Jan. 31 (the end of the Company's financial year) had been £277,649. The profit earned in the twelve months amounted to £39,819, which was an increase of £817 over the previous year. After payment of the dividend, there will be a balance of £17,430 to be carried forward. Last year £1000 was voted to different relief funds in connection with the war.

Sunderland Gas Company.—In moving the adoption of the report and accounts at the annual meeting of the Company, the Mayor (Alderman Stansfield Richardson), who is Chairman, said the accounts for the year ended Dec. 31 showed a profit of £23,500, as compared with £22,237 in 1914, and £25,144 in 1913. He paid a tribute to the work of the Directors and the staff in overcoming the immense difficulties placed before them. Despite all the troubles, he said, they had been able to declare the maximum dividend for the year; and they had made no advance in the price of gas. At the present time, upwards of 40 per cent. of the employees had joined the Colours; and practically all of those remaining who were of military age had attested under Lord Derby's scheme. They had done their best to fill the vacant positions with female labour; and the Company were very well satisfied with the work women were doing. With regard to the allowance to dependants, they had paid a sum of £1682. Owing to the lighting restrictions, the consumption of gas showed a decrease of 2½ per cent. He concluded by moving that a dividend of 5 per cent. be declared on the original stock and 4½ per cent. on the additional capital stock, less income-tax. This was carried unanimously.

STOCK MARKET REPORT.

Business on the Stock Exchange was more than quiet. It is a common, and often a misused, expression to speak of something as "unprecedented;" but last week the term was by general consent held fairly applicable to the state of things in the House. There was no pronounced factor of depression at work—in fact, the trade returns were favourable. But the public showed no disposition to take any step at all, much less any risks. There were slight movements from time to time in some markets, as each happened to be swayed by internal influences. In Government issues, the War Loan and Consols rather weakened about midweek; but later on they effected a recovery. Until it is possible to know something about the new loan that is to be, they are not likely to show much activity. Home Rails were almost inanimate, and movements were slight and irregular. In Americans, there was a little improvement. Canadians were better, but only moderately so, considering the progressive prosperity of the country. The Foreign Market generally was weaker, and the notably strong spots there recently apparent failed to hold their ground. The French loan was easier for a day or two, but steadied subsequently. Japanese fell when deprived of Government support; but Chinese was in good demand. Things in South America seem to be looking up. South Africans were rather firmer. In the Miscellaneous Market, movements were somewhat irregular. Rubber and oil had a dull fit now and then, and copper was not at its best. In the Money Market, rates both for short loans and for discount hardened. The Government sales of Treasury Bills and Bonds were good. Among other topics of interest, the question of a War Loan issue of Bonus Bonds containing an element of prize-winning upon redemption was much discussed; and the principle received influential support as being likely to prove highly popular. In the House the Anti-German agitation is materializing, and elections on to the Committee will be influenced by it. Business in the Gas Market was moderate and devoid of any marked characteristic. Record prices were the same as the preceding week, with at most only fractional variation here and there.

Bargains done for cash during the week were as follows: On Monday, Bournemouth "B" 11⅛, European 12¼, 12⅜, 12⅞, Imperial Continental 63¼, Primitiva 2 1/16, 2⅛, ditto preference 3 3/16, 3⅜, South Metropolitan 75⅛, 75⅜, 76, Tottenham "B" 92, 92½. On Tuesday, Bournemouth "B" 11 3/16, Gas Light ordinary 72¼, 72⅜, 73, Imperial Continental 60¾, ditto debenture 64½, 65, Primitiva 2 3/16, South Metropolitan 75, 75⅛. On Wednesday, European 12¼, Gas Light ordinary 72¼, 72½, 72⅜, Primitiva debenture 83, 83¼, ditto (1911) 62¼, 62½, South Metropolitan 76. On Thursday, Cape Town 1⅜, Gas Light ordinary 72⅜, 72 7/16, 72½, 72⅝, ditto preference 74⅛, 75, 75¼, Imperial Continental 60¼, 61, Primitiva 2 1/16, ditto preference 72s., 72s. 6d. On Friday, Alliance and Dublin 62, Cape Town debenture 65, Commercial 3½ per cent. 69¼, 69½, European 12⅜, 12 7/16, Gas Light ordinary, 72, 72¼, 72⅜, 72 5/16, 72½, 72⅝, 72¾, ditto preference 74⅛, 74⅜, 75, Primitiva 2¼, ditto preference 72s. 6d., 73s. 9d., South Metropolitan 75⅝, 76. On Saturday, Gas Light ordinary 72¼, 72½, ditto preference, 74⅛, 74⅜, ditto debenture 60, South Metropolitan 76.

The Bank rate is 5 per cent.—as fixed on Aug. 8, 1914.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Previous Div or Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.				£ s. d.	
1,551,868	Stk.	April 8	9½	5⅛	Alliance & Dublin Ord.	59—64	8 18 2	61
374,000	"	July 10	4	4	Do. 4 p.c. Deb.	76—79	5 1 8	..
280,000	5	April 29	7½	3/-	Bombay, Ltd.	5⅞—6⅜	5 17 8	..
50,000	10	Feb. 26	16	15/-	Bournemouth Gas and Water { B 7 p.c. Pref. 6 p.c. 4 p.c. Deb.	29—30	5 6 8	..
333,110	10	"	7	7/-		15—15½	4 10 4	11⅜—11 13/16
115,000	10	"	6	6/-		13½—14	4 5 9	..
153,740	—	—	—	4		..	—	..
992,045	Stk.	Feb. 26	†14	£6/-	Brentford Consolidated	261—266	5 5 8	..
734,910	"	"	†11	55/-	Do. New	204—209	5 5 8	..
55,000	"	"	5	5	Do. 5 p.c. Pref.	109—111	4 10 1	..
221,400	"	June 11	4	4	Do. 4 p.c. Deb.	91—93	4 6 0	..
217,880	Stk.	Feb. 26	11	10⅜	Brighton & Hove Orig.	208—213	5 8 4	..
244,900	"	"	8	7⅜	Do. A Ord. Stk.	154—159	5 0 8	..
580,000	20	Mar. 26	12½	22/6	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2⅛	—	1⅜
100,000	10	—	—	4/6	Do. 4½ p.c. Pref.	4—6	—	..
100,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	65
157,150	Stk.	Feb. 26	5	5	Chester 5 p.c. Ord.	108—110	4 10 11	..
1,518,980	Stk.	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	5 1 2	..
660,000	"	"	5½	46/8	Do. 3½ p.c. do.	103—105	5 1 6	69¼—69½
475,000	"	June 11	3	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 8 11	..
800 000	Stk.	"	4	4	Continental Union, Ltd.	76—79	5 1 8	..
200 000	"	"	7	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
278,400	"	"	—	11½	Croydon B and C 7 p.c.	..	—	..
492,370	Stk.	—	6	5½	Derby Con. Stk.	138—135	4 16 0	..
55,000	"	—	4	4	Do. Deb. Stk.	102—104	3 16 11	..
1,002,180	10	July 29	10	10/-	European, Ltd.	17½—18	5 11 1	12¼—12 7/8
16,337,185	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke { 4 p.c. Ord. 3½ p.c. max. 4 p.c. Con. Pref. 3 p.c. Con. Deb.	98—102	4 15 6	72—78
2,600,000	"	"	3½	3½		76—79	4 8 7	..
4,062,235	"	"	4	4		96—99	4 0 10	74½—75½
4,674,850	"	June 11	3	3		72½—74½	4 0 6	60
130,000	"	"	10	10	10 p.c. Bonds	..	—	..
258,740	Stk.	Mar. 12	5	4½	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	6	Hongkong & China, Ltd.	16½—16¾	6 11 4	..
86,600	—	—	—	9½	Hornsey 7 p.c.	..	—	..
131,000	Stk.	Mar. 12	7½	7½	Ilford A and C	151—154	5 2 4	..
65,780	"	"	6⅜	5⅞	Do. B	115—118	5 8 0	..
65,500	"	June 26	4	4	Do. 4 p.c. Deb.	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	4½	Imperial Continental	150—160	5 12 6	60½—63½
1,335,000	Stk.	Feb. 12	3½	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	64½—65
235,242	Stk.	Mar. 12	6½	6½	Lea Bridge Ord. 5 p.c.	119—121	5 7 5	..
2,498,903	Stk.	Feb. 26	10	10	Liverpool 5 p.c. Ord. { A B	211—213 146—148	4 13 11 4 14 7	..
806,083	"	June 26	4	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	..
75,000	5	June 11	6	2/-	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	4½—4⅝	6 9 9	..
250,000	100	April 1	4½	4½		99—101	4 9 1	..
541,220	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	6 18 4	..
1,875,892	Stk.	July 29	4½	4½	Newc'tle&G'tesh'd Con.	98½—99½	4 10 6	..
529,705	Stk.	June 26	3½	3½	Do. 3½ p.c. Deb.	83—88	4 4 10	..
55,940	10	Feb. 26	7/14/0	7/8½	North Middlesex 7 p.c.	14—15	5 2 8	..
800,000	Stk.	May 14	8	8	Oriental, Ltd.	117—122	6 11 2	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7¾	6 9 0	..
60,000	50	Feb. 26	12	65/-	Porto Rican Island B	128—131	4 19 8	..
100,000	50	"	12	60/-	Do. C	118—121	4 19 2	..
52,000	50	"	10	—	Do. D	..	—	..
949,980	5	April 29	8	—	Primitiva Ord.	5⅜—6	6 18 4	2 1/16—2⅛
499,960	5	June 26	6	2/6	" 5 p.c. Pref.	4⅝—5	5 0 0	71/8—78/9
521,600	100	June 2	4	4	" 4 p.c. Deb.	91—98	4 6 0	83—83½
—	—	—	—	4	" " " 1911	..	—	62½—62⅝
846,198	Stk.	June 26	4	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref. 5 p.c. Deb.	10½—11	5 9 1	..
125,000	50	July 1	5	5		47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	10	Sheffield A	223—224	4 9 8	..
209,984	"	"	10	10	Do. B	222—224	4 9 8	..
523,500	"	"	10	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	6/-	South African	10½—11½	7 16 6	..
6,609,895	Stk.	Feb. 10	5/4/0	44/-	South Met., 4 p.c. Ord.	111—113	4 16 8	75—76
1,896,445	"	July 10	3	3	Do. 3 p.c. Deb.	73½—74½	4 0 6	..
224,830	Stk.	Feb. 26	8½	8	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	5 8 5	..
60,000	"	"	5	5	Do. 5 p.c. Pref.	110—112	4 9 8	..
195,000	—	—	—	48/4	Do. West Kent.	..	—	..
187,538	"	June 26	5	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
629,740	Stk.	May 14	5	5	Southampton Ord.	99—102	4 18 0	..
190,000	Stk.	Feb. 12	7½	7½	Tottenham District { A 5 p.c. B 3½ p.c. 4 p.c. Deb.	185—188	5 8 8	..
782,275	"	"	6	6		115—117	5 2 7	92—92½
181,255	"	June 26	4	4		87—89	4 9 11	..
183,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—8	8 6 8	..
149,900	10	July 1	5	5	Do. 5 p.c. Deb. Red.	93—95	5 5 8	..
236,476	Stk.	Mar. 12	5	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	Stk.	Feb. 26	8⅜	78/9	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,686	"	"	6⅜	63/9	" B 3½ p.c.	129—134	5 2 7	..
108,075	"	"	5/17/8	55/1½	" C 3½ p.c.	110—115	5 2 0	..
869,000	"	"	6½	67/6	Wimbledon 5 p.c.	117—122	5 0 5	..
98,000	"	"	6⅜	63/9	Epsom 5 p.c.	121—126	5 5 2	..
88,416	"	June 26	3	3	3 p.c. Deb. Stk.	66—69	4 6 11	..

* Ex. Div. † Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

The total weight of cast-iron pipes and fittings imported into all seaports of British India in the fiscal year 1914-15 was 27,021 tons from the United Kingdom, 794 tons from Germany, 107 tons from Belgium, and 11,814 tons from the United States. The declared value was £415,664—a decrease of £97,330 on the previous year.

The Swansea Gas Company announce the sale by tender of £20,000 of 5 per cent. ordinary stock, offers for which must be received by them on or before the 18th inst. It is pointed out that, despite drastic public and domestic economies in gas consumption during 1915, the total sales of gas increased; and the business in other directions has expanded and developed to an exceptional extent. Therefore to meet requirements in the near future the Directors have found it necessary to provide for additional manufacturing plant which will increase the producing capacity of the works by over 20 per cent. The stock is not offered generally but only to existing stockholders, gas consumers, and the local public.

It is reported that one of the iron and steel companies that have done very well during the past year is Messrs. Stewarts and Lloyds, Limited, of Glasgow and Birmingham. The full profit figures are not yet available; but after setting aside £100,000 for depreciation, and making provision for contingencies under the Munitions of War and Finance Acts, the Directors will recommend the payment of the fixed dividend of 10 per cent. on the preferred ordinary shares and also a distribution of 2s. and a bonus of 6d. per share on the deferred shares. Then £60,000 is to be placed to general reserve, £20,000 to the employees' benefit reserve, and £100,000 is carried forward. The distribution on the deferred shares equals 12½ per cent., and compares with 10 per cent. in 1914. The amount written off for depreciation that year was the same as now; but only £50,000 was placed to general reserve and £10,000 to the employees' benefit fund—£97,666 being carried forward. Apparently, therefore, after providing for all special war taxation, including the excess profits duty, the available earnings showed an increase of more than £30,000.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

MANAGER (COKE-OVENS). Yorkshire Coking and Chemical Company, 11 and 12, Pall Mall, S.W.
GAS AND WATER ENGINEER AND MANAGER. Tyldesley Urban District Council. Applications by March 20.
GAS AND WATER ENGINEER. Leigh (Lancs.) Corporation. Applications by March 23.
MANAGER (WAREHOUSES). No. 302, Smith's Advertising Agency.
ASSISTANT. Ilfracombe Gas Company.
SUPERVISING FOREMAN. Nechells Gas-Works, Birmingham.
CARBONIZING FOREMAN. No. 6163.
GAS AND WATER FITTERS. Winchester Water and Gas Company.
MAIN AND SERVICE LAYER. Todmorden Gas Department.

Meeting.

BRITISH GASLIGHT COMPANY. 11, George Yard, Lombard Street, E.C. March 29. Twelve o'clock.

TENDERS FOR

Coal.

DARLINGTON GAS DEPARTMENT. Tenders by March 23.
LIVERPOOL GAS COMPANY. Tenders by March 20.
MAIDSTONE GAS COMPANY. Tenders by March 22.

General Stores (Sulphuric Acid, Lead Tubing, Barrows, Rakes, Taps, Locks, Slot Fittings, Oils, Benzol, &c.).

PONTYPRIDD GAS DEPARTMENT. Tenders by March 28.

Lighting Goods (Lamps, Incandescent Materials).

PONTYPRIDD GAS DEPARTMENT. Tenders by March 28.

Meters.

PONTYPRIDD GAS DEPARTMENT. Tenders by March 28.

Cookers.

PONTYPRIDD GAS DEPARTMENT. Tenders by March 28.

Pipes, &c.

PONTYPRIDD GAS DEPARTMENT. Tenders by March 28.

Tar and Liquor.

COCKERMOUTH GAS DEPARTMENT. Tenders by March 27.
MARPLE GAS DEPARTMENT. Tenders by March 21.
PONTYPRIDD GAS DEPARTMENT. Tenders by March 28.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders to Alter or stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Saturday.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 23s. 6d.; Half Year, 12s.; Quarter, 6s. 6d.
Payable in advance. If credit is taken, an extra charge of 4s. a year is made.

Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, FLEET LONDON." Telephone: Holborn 6857.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 171, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

ALDER AND MACKAY
(ESTABLISHED 1850).
WET AND DRY METERS.
SLOT AND ORDINARY.
STREET LAMPS AND AUTOMATIC CONTROLLERS.
EDINBURGH.

R. & G. HISLOP,
GAS ENGINEERS, RETORT BUILDERS, CONTRACTORS, &c.
RETORT SETTINGS, COAL TESTING PLANT, BOILER FIRING.
Communications should be addressed to UNDERWOOD HOUSE, PAISLEY.

SULPHURIC ACID.

SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD., with which is amalgamated WM. PEARCE & SONS, LTD., 36, Mark Lane, LONDON, E.C. Works—SILVERTOWN.
Telegrams—"HYDROCHLORIC, FEN. LONDON."
Telephone—1588 AVENUE (3 lines).

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, London, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LAMB LONDON."

SEND your inquiries for Carburetted HYDROGEN AND BLUE WATER-GAS PLANT, also TAR DEHYDRATING PLANT and other GAS-WORKS APPARATUS to—
BALE AND HARDY,
89, VICTORIA STREET, WESTMINSTER, S.W.

MEWBURN, ELLIS, AND PRYOR.
CHARTERED PATENT AGENTS AND TRADE MARK AGENTS,
70, Chancery Lane, London.
Telegrams: "Patent London." 'Phone: 243 Holborn.
And 8, St. Nicholas Buildings, Newcastle-on-Tyne.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Feb. 22, p. 440.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS.
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the Enrichment of Gas.
Manufactured and Supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agents, F. J. NICOL & Co., Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

OXIDE OF IRON.
We are in a position to Supply Oxide of Iron promptly, and invite Enquiries.
SPENT OXIDE WANTED.
BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

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BALE & CHURCH, LTD.
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"KLEENOFF," THE COOKER CLEANSER.
Tins for sale to Consumers.
In Bulk for Works Use.
BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

J. E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams—"SATURATORS BOLTON." Telephone 0848.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

CANNOCK, HEDNESFORD, AND DISTRICT GAS COMPANY, LIMITED.
APPLICANTS for the Position of WORKS ENGINEER and MANAGER for above Company are THANKED, and informed that AN APPOINTMENT HAS NOW BEEN MADE.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every Description of GAS APPARATUS, ELEVATING, CONVEYING, and TELPHERAGE PLANTS, also STOKING MACHINERY, ROSE MOUNT IRONWORKS, ELLAND.

TYLDESLEY-WITH-SHAKERLEY URBAN DISTRICT COUNCIL.

APPOINTMENT OF GAS AND WATER ENGINEER AND MANAGER.

THE above Council invite Applications for the Post of ENGINEER and MANAGER of the Gas and Water Departments from persons with Practical Experience in a similar capacity.

Salary, £200 per Annum.

The person appointed will be required to Reside in the District and Devote his Whole Time to the Duties.

Applications, on the Official Form, which may be obtained on receipt of Stamped Addressed Envelope from the undersigned, must be Delivered at the Council Offices on or before the 20th inst.

Canvassing in any form will bar appointment.

By order.
W. J. MATTHEWS,
Clerk to the Council.

Council Offices,
Tyldesley, March 8, 1916.

THOROUGHLY Competent Manager Required to Superintend Bye-Product Coke-Works (Koppers' System) at Castleford. No person resident more than 10 miles from the Advertisers' Works, or already engaged on Government Work, will be engaged.

Apply, stating Age, Experience, Qualifications, and References, to the YORKSHIRE COKING AND CHEMICAL COMPANY, LIMITED, 11 and 12, Pall Mall, LONDON, S.W.

MANAGER for Warehouses, Packing, and Despatch Departments, to Supervise Final Testing of finished Gas Apparatus, Control Workpeople and Warehouse, and Office Staff. Systematic and Capable Organizer. Commencing Salary, £200.

BOX 302, SMITH'S AGENCY, LIMITED, 100, FLEET STREET, E.C.

ILFRACOMBE GAS COMPANY.

WANTED—A Capable Assistant for the Works of the above Company.

Full Particulars of Duties, &c., can be obtained from J. ARMSTRONG, General Manager.

BOROUGH OF LEIGH.

APPOINTMENT OF GAS AND WATER ENGINEER.

THE Corporation of Leigh invite Ap- plications for the Position of GAS AND WATER ENGINEER for the Borough.

Salary, £350 per Annum, increasing by annual increments of £50 (subject to approved service) to a maximum of £450.

Candidates, in addition to the Ordinary Duties of Gas and Water Engineer, must be Competent to Design and Supervise the Construction of New Works, Additions, or Extensions to Existing Works.

The person Appointed will be required to Devote the Whole of his Time to the Duties of the Office, and Reside within the Borough.

Applications, accompanied by *copies* of not more than three Testimonials of recent date, and endorsed "Gas and Water Engineer," must be Delivered to me not later than the 23rd inst.

Canvassing members of the Council will be a Disqualification.

W. H. COWBURN,
Town Clerk.

Town Hall, Leigh (Lancs.),
March 11, 1916.

WANTED, for large Yorkshire Gas- Works, a CARBONIZING FOREMAN. Must have had Experience with Stoking Machinery, Telpher Plant, &c., and be able to Control Workmen. Wages, £2 10s. per Week.

Applications, by letter, stating Age and Experience, to be sent to No. 6163, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

CITY OF BIRMINGHAM.
(GAS DEPARTMENT.)

A THOROUGHLY Capable and Ex- perienced SUPERVISING FOREMAN required for the Nechells Works of the above. Applicants must be Experienced in all Modern Methods of Gas Manufacture, and fully Capable of Supervising men.

Particulars may be obtained from the ENGINEER, Nechells Gas-Works, BIRMINGHAM, to whom Applications with Testimonials must be addressed.

TODMORDEN CORPORATION.
(GAS DEPARTMENT.)

WANTED—A Main and Service Layer, Ineligible for Military Service.

Apply, by letter, stating Age, Experience, and enclosing *copies* of Testimonials, to the MANAGER, Gas Department, TODMORDEN.

WANTED—Gas and Water Fitters, Ineligible for Military Service.

Apply, by letter, stating Age, Experience, and enclosing *Copies* of Testimonials, to the WINCHESTER WATER AND GAS COMPANY, 19, Staple Garden, WINCHESTER.

GASHOLDER and Iron or Steel Tank WANTED, of about 40,000 to 60,000 Cubic Feet capacity, for Re-Erection.

State Price, &c., to No. 6159, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

PURIFIERS Wanted—Set of Purifiers from 15 to 25 feet Square. Preferably Dry, Luteless Covers.

Address, No. 6160, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

WANTED—Good, Clean, and Hard CARBON, in Four-Ton Lots, or more, f.o.r.

Address, No. 6072, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

PONTYPRIDD URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE above Council invite Tenders for the Supply of the following STORES and MATERIALS required for the Year ending March 31, 1917:—

No. 1.—GAS-COOKERS.
No. 2.—SULPHURIC ACID.
No. 3.—HORSE FEED.
No. 4.—STREET LANTERNS.
No. 6.—W.I. TUBES and FITTINGS.
No. 7.—LEAD and COMPO TUBINGS.
No. 8.—BARROWS, RAKE HEADS, &c.
No. 9.—OILS and BENZOL.
No. 10.—INCANDESCENT MATERIALS.
No. 11.—SLOT FITTINGS.
No. 12.—METERS.
No. 13.—MAIN TAPS and LOCKS.
No. 14.—CAST-IRON MAINS and SPECIALS.

Forms of Tender and Conditions may be obtained on Application to Mr. E. H. Swain, Engineer, Gas-Works, Treforest, Pontypridd.

Tenders on the Prescribed Forms, Sealed and Endorsed "Tenders for Gas Stores No. —" (as the case may be), must be received by the undersigned on or before Tuesday, March 28, 1916.

The Council do not bind themselves to accept the lowest or any Tender.

J. COLENSO JONES,
Clerk to the Council.

Municipal Buildings,
Pontypridd, March 10, 1916.

PONTYPRIDD URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE above Council invite Tenders for the Purchase of the Surplus COAL-GAS TAR and WATER-GAS TAR produced at their Treforest Works during the Year ending March 31, 1917.

The Tar will be Delivered into the Purchaser's Railway Tank-Waggons at the Treforest Gas-Works Siding.

Forms of Tender and Conditions may be obtained on Application to Mr. E. H. Swain, Engineer, Gas-Works, Treforest, Pontypridd.

Tenders on the Prescribed Forms, Sealed and Endorsed "Surplus Tar," must be received by the undersigned on or before Tuesday, March 28, 1916.

The Council do not bind themselves to accept the highest or any Tender.

J. COLENSO JONES,
Clerk to the Council.

Municipal Buildings,
Pontypridd, March 10, 1916.

MARPLE URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TAR AND LIQUOR.

THE Gas Committee of the above Council invite TENDERS for the Purchase of surplus TAR and AMMONIACAL LIQUOR produced at the Gas-Works during the Year ending March 31, 1917.

The Tar and Ammoniacal Liquor will be required to be taken Direct from the Works by the Purchaser.

Contractors must Tender on their own Forms.

Tenders, endorsed "Tar and Liquor," and addressed to the Chairman of the Gas Committee, Council Offices, Marple, must be Delivered not later than four o'clock p.m. on Tuesday, the 21st inst.

J. W. RAMSBOTTOM,
Clerk to the Council.

Council Offices, Marple,
Cheshire, March 11, 1916.

COCKERMOUTH URBAN DISTRICT COUNCIL.

THE Gas Committee of the above Coun- cil are prepared to receive TENDERS for the Purchase of Surplus TAR (about 170 tons) produced from the 1st of April, 1916, to the 31st of March, 1917; also stock (about 80 tons) at present on hand for Immediate Removal.

Price to be f.o.r. in Contractor's own Tank-Waggons at Cockermouth.

Any other Particulars required from the undersigned, to whom Tenders should be Delivered on or before Monday, the 27th of March, 1916.

A. F. YOUNG,
Manager and Secretary.

Gas-Works, Cockermouth.

LIVERPOOL GAS COMPANY.

TENDERS FOR COAL.

THE Directors of the Liverpool Gas Company are prepared to receive TENDERS for the Supply of 50,000 Tons of COAL, to be Delivered at the various Works of the Company during the period of Three Months between the 1st of April, 1916, and the 30th of June, 1916.

Tenders will be received for the whole or any portion of the above quantity.

The Directors reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

Full Particulars and Printed Forms of Tender can be obtained on Application to the undersigned, at the Gas Office, Duke Street, Liverpool.

Sealed Tenders (on the Printed Form only), addressed to the Chairman of the Company, must be Delivered at or before 10 a.m. on Monday, the 20th of March, 1916, endorsed "Tender for Coal."

R. E. GIBSON,
Engineer.

Gas Office, Duke Street,
Liverpool, March 8, 1916.

MAIDSTONE GAS COMPANY.

THE Directors of the Maidstone Gas Company invite TENDERS for the Supply of 16,000 Tons of Unscreened Durham GAS COALS Delivered in Barge alongside their Wharf on the Medway, Maidstone, over the Thirteen Months commencing June 1, 1916.

The Directors also invite TENDERS for 10 000 Tons of Screened Yorks GAS COALS or Washed Yorkshire NUTS Delivered at Maidstone West Station over the same period.

Any further Particulars required can be obtained from the undersigned, to whom Tenders should be Delivered not later than March 22.

The Directors do not bind themselves to accept the lowest or any Tender.

FRANK LIVESEY,
Engineer and Manager.

Maidstone, March 9, 1916.

COUNTY BOROUGH OF DARLINGTON.
(GAS-WORKS DEPARTMENT.)

TENDERS FOR GAS COALS.

THE Corporation of Darlington invite TENDERS for their requirements of Freshly-Wrought GAS COALS, Delivered to the Gas-Works Sidings as required during the ensuing Twelve Months.

Further Particulars and Form of Tenders may be obtained from Mr. Frank P. Tarratt, Gas-Works Engineer, Darlington.

Tenders, endorsed "Tender for Gas Coals," to be Delivered at my Office, Houndgate, Darlington, not later than the first post on Thursday, March 23, 1916.

No pledge is given that the lowest or any Tender will be accepted.

HY. G. STEAVENSON,
Town Clerk.

Town Clerk's Office,
Darlington, March 6, 1916.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Chief Office of the Company, No. 11, George Yard, Lombard Street, in the City of London, on Wednesday, the 29th day of March, at Twelve o'clock precisely, to Transact the usual Business, and to declare a Dividend for the Half Year ended the 31st of December last.

NOTICE IS HEREBY ALSO GIVEN that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 18th inst., and RE-OPENED on the 30th inst.

By order of the Court of Directors,
A. W. BROOKES,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
March 9, 1916.

PATENTS.—Handbook of Patent Law, by W. P. THOMPSON, F.C.S., M.I.Mech.E., C.P.A., International Patent Agent, 6, Lord Street, Liverpool, and Bradford and London. 16th Edition 1915, 242 pages. 2s. 6d. Post free. English Portion, 6d. "A useful guide to inventors. The subject is treated in a simple and concise manner."—JOURNAL OF GAS LIGHTING.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at THE MART, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 37, WALBROOK, E.C.

"CAPTIVE FIRE"
System
Of Burning Gaseous Fuel.

Particulars of the System were given in Advertisements appearing in the "JOURNAL" for May 25 and June 1 and 8 (pp. 471, 525, 596).

For further Particulars apply to

A. C. IONIDES, 34 Porchester Terrace, London, W.

R. & J. DEMPSTER, LTD. 64 & 2296 Manchester. KENTISH TOWN, N.W. FOR PATENT SLOT METER PAD & OTHER LOCKS.